6. *New Lamellibranchia and Gastropoda from the Upper Cretaceous of Pondoland (with an Appendix on some Species from the Cretaceous of Zululand).*—By John V. L. Rennie, M.A., Webb Research Scholar, Department of Geology, University of Cape Town.

(With Plates XVI–XXXI and 3 Text-figures.)

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* These species have already been specifically determined from the Umzamba Beds.

1. Introduction.

Historical.—No additions have been made to our knowledge of the Lamellibranchia and Gastropoda of the Upper Cretaceous deposits of the coast of Pondoland since the publication in 1906 of Woods' important monograph on the Cretaceous Fauna of Pondoland. It is the purpose of this paper to describe the Lamellibranchia and Gastropoda contained in three collections made subsequently to the publication of the above monograph. The Cephalopoda of these collections have already been described in important papers by E. C. N. van Hoepen and L. F. Spath, and have yielded important results.

The highly fossiliferous beds near the mouth of the Umzamba were discovered more than a century ago by H. F. Fynn, and were brought to the notice of the scientific world by Garden in 1855 (**23a**).* The collection made by the latter was described in the same year by Baily (**2**), who was able to compare the fauna with those of Southern India. A number of new species and the stratigraphy of the beds were described in 1871 by Griesbach (**25**), who, on the basis of what must now be regarded as insufficient collecting, divided the sequence of beds into five main zones, which he believed to represent a wide range of time in the Upper Cretaceous.

The locality was not again visited until 1901, when Rogers and Schwarz (then members of the Cape of Good Hope Geological Commission) recovered a considerable number of fossils and made observations on the stratigraphy which were included in the annual report for that year (**52**). The collecting made it clear that the beds represent only a short time-range in the Upper Cretaceous, since all the common species were found to range through the deposit. The new material was the occasion for a paper by Chapman in 1904 (**3a**) on the Foraminifera and Ostracoda, and in 1906 the fauna was monographed by Woods (**77**), who brought the total number of molluscan species up to about eighty, and stated that the beds were Campanian and probably referable to one zone.

The stratigraphy of the Umzamba Beds was described by du Toit in 1913 (**14**) and again in 1920 (**15**), and also by Plows in 1921 (**49**).

Three extensive collections of material from the same locality have been made in recent years. That made by E. C. N. van Hoepen is in the Transvaal Museum, Pretoria, and the Cephalopoda contained in it, together with some purchased specimens, were described by van Hoepen in 1920 (**64**) and 1921 (**65**); a pre-Campanian age was claimed for the fauna.

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* The numbers in heavy type refer to the list of references at the end of the paper.

A smaller but very interesting collection was made by W. J. Plows and E. C. Chubb for the Durban Museum, the Cephalopoda of which were described by Spath in 1921 (**57**). An important work on the Cretaceous Cephalopoda of Zululand, in which frequent references are made to the Umzamba fauna, was published by the same author in 1921 (**58**), and was followed by a review of the Ammonoidea of Pondoland, including the description of new species contained in a collection presented to the British Museum by the Natal Government in 1894 (**59**). Spath's researches led him to believe that both Campanian and Maestrichtian Ammonoidea occur in the Pondoland fauna and that the Umzamba Beds could and should be zoned (**59**, p. 116).

To investigate the possibility of distinguishing palaeontological zones in the beds was the object of a visit paid to the deposits by Gevers in 1923, on behalf of the South African Museum, Cape Town. The results of very careful collecting, bed by bed, are set forth in an accompanying table.

Acknowledgments.—The material described in this paper comprises the following: (*a*) a large collection obtained by Dr. E. C. N. van Hoepen for the Transvaal Museum, Pretoria; (*b*) a collection made for the Durban Museum by the Curator, Mr. E. C. Chubb, and by Mr. W. J. Plows; (*c*) a large assemblage of species collected by Dr. T. W. Gevers for the South African Museum, Cape Town.

The writer wishes to express his indebtedness to Dr. S. H. Haughton, Honorary Keeper of the Palaeontological Collections in the South African and Transvaal Museums, for encouragement in the undertaking of this work, for supplying him with a list of the Ammonoidea contained in the Gevers Collection, and for help in various ways. The writer is particularly grateful to Dr. L. Gill, Director of the South African Museum, for arranging for the publication of this paper. To Mr. E. C. Chubb and Mr. C. J. Swierstra, Curators of the Durban and Transvaal Museums respectively, thanks are due for the use of the material in those institutions. The writer's thanks are due to Dr. T. W. Gevers for permission to publish in tabulated form the results of his careful collecting. The bulk of the work was carried out in the Sedgwick Museum, Cambridge, and the writer wishes to express his thanks to Mr. Henry Woods, M.A., F.R.S., for help in various ways.

A special note of appreciation must be expressed to Miss E. T.

Talbot, of Cambridge, for her enthusiasm and untiring patience in the preparation of the plates for this and a previous paper.

The catalogue numbers of the specimens are given in the case of those belonging to the collections of the South African and Transvaal Museums. The Lamellibranchia, Gastropoda, and Echinoidea of the Gevers Collection are distributed as follows (see Table A, p. 251) :—

S.A. Mus.,	8365–8389,	bed 10.	S.A. Mus.,	8619–8623,	bed 23.
,,	8390–8453	,, 18A.	,,	8624–8627	,, 12.
,,	8454–8488	,, T.	,,	8628–8643	,, 5A.
,,	8489–8519	,, 21A.	,,	8675–8686	,, 5A.
,,	8520–8562	,, 4A.	,,	8687–8697	,, 18.
,,	8563–8571	,, 11A.	,,	8698–8705	,, 21.
,,	8572–8605	,, 3.	,,	8706–8723	,, 16.
,,	8606–8616	,, 4.	,,	8724–8734	,, 17.
,,	8617–8618	,, 15.			

2. Discussion.

Stratigraphy.—The deposits have been described in considerable detail by Rogers and Schwarz (**52**), du Toit (**14**, **15**), and Plows (**49**). It suffices here to recall that the strata consist of thin alternating bands of sandy, calcareous clays, sometimes pebbly, and hard, shelly limestones, which occur intermittently along a stretch of coast about 25 miles long from near the mouth of the Umtentu in Pondoland to the mouth of the Umpenyati in Alfred County, Natal. The beds have a slight dip seawards (about 2° to 4°), and rest unconformably upon a planed surface of Table Mountain Sandstone. The beds are only exposed at intervals along the coast, as ledges which only occasionally appear above mean sea-level, and the beds are covered inland by blown sand. Though typical Umzamba species have been found at the northernmost outcrop at the Umpenyati, and also in the Umgazana outlier south of Port St. Johns, nearly all the material hitherto described has been obtained from one locality, the so-called Fossil Head immediately north of the Umzamba mouth. Here the Umzamba Beds rise into a cliff over 30 feet high, above which are bush-covered slopes. There is reason to believe that all the fossils hitherto collected from this locality were obtained from beds ranging from between low-tide mark to about 20 feet above mean sea-level.

Palaeontological Zoning.—Rogers and Schwarz (**52**, p. 43) were of the opinion that the greater number of the species existed throughout the whole of the time occupied by the deposition of the rocks seen at the Fossil Head section, but that in the coarser deposits, which were formed in shallower or more disturbed water than the finer, only the stronger shells were preserved. The more robust species, like *Glycimeris africana*, *Crassatellites africanus*, and *Nordenskjöldia natalensis*, were found by them in both coarse and fine-grained beds, in the former much abraded; the more delicate shells were obtained from the finer-grained beds alone.

All subsequent collecting has tended to strengthen the conviction that one palaeontological zone only is represented, though the distribution of the species within the beds has not hitherto been presented in tabulated form.

The results of very careful collecting by Gevers are set forth in Table A. The first section was made at the best exposed portion of the cliff, the lithological bands being numbered from Bed 1 (the lowest) to Bed 23 (the highest bed accessible from the base of the cliff). By lowering himself over the top of the cliff at this spot, Gevers was able to recover a considerable number of fossils from a bed situated considerably higher than Bed 23, the intervening beds being inaccessible; this top bed (Bed T) is about 10 feet above Bed 23. The second section was made some yards to the north of the first, the bands being numbered from Bed 1A (the lowest) to Bed 21A (the highest bed accessible from the base of the cliff). Owing to the discontinuous nature of the lithological bands, it was not possible to correlate the two sections with certainty.

It is evident from Table A that all the common Pondoland Lamellibranchia and Gastropoda have a great vertical range in the deposits. Bed T, which is considerably higher than Bed 23 (and Bed 21A), contains essentially the same fauna as, for example, Bed 4A and Bed 3 near the base of the deposits. It should be pointed out that, as far as can be ascertained, no fossils have hitherto been collected from a horizon higher than Bed 23.

The evidence for the range of the Ammonoidea in the deposits is unfortunately rather meagre. In the first place, the common *Pseudoschloenbachia griesbachi* was collected by Gevers from beds ranging from Bed 3 to Bed 23, and the allied *P. umbulazi*, as well as *Hauericeras gardeni*, have almost as wide a range. The only species obtained from the uppermost bed (Bed T) was *Hoploscaphites* sp., but the same species was obtained from near the base in Bed 4A. *Pseudophyllites indra* was found at the base of the section by Rogers and Schwarz (*teste* Woods, **77**, p. 347). Spath (**59**, p. 116) drew attention to the fact that Plows (**49**, p. 63) has recorded *Mortoniceras soutoni* from a bed well above that containing *P. indra* ; but *M. soutoni* was recorded from the basement bed by Rogers and Schwarz (**52**, p. 41) and was found there also by Gevers. *Gaudryceras varicostatum* was obtained by Gevers from Bed 16A ; the " *Ammonites kayei*," recorded by Griesbach, is probably identical and was obtained from his zone " d," which is considerably lower in the section.

There is as yet no evidence for assuming that more than one zone is present in the Umzamba Beds, and it seems highly probable that with further collecting the ranges of many of the species will be greatly extended. It should be borne in mind that each visit to the locality has resulted in the recovery of new species, and that a large proportion of the species are still represented by one or two specimens only. Moreover, it is quite evident from the various accounts that have been given of the stratigraphy, that the lithological bands are lenticular in form and have little lateral extension. The alternation of thin bands of different kinds of sediment suggests that the deposits were formed under conditions of rapid current-change, and it may well be that the whole of the Umzamba Beds (as now exposed) was laid down in a relatively short space of time.

Age and Distribution of the Fauna.—The geographical distribution of the Lamellibranchia and Gastropoda is set forth in Table B (p. 254), which is in part an extension of that given by Woods (**77**, pp. 349, 350).

Spath (**58**, p. 269) has pointed out the very great differences between the Cephalopoda of the Umzamba Beds and those of Umkwelane Hill in Zululand, differences which appear to be due to a difference of facies between the two deposits. As is pointed out in the appendix to this paper, these differences are not so evident among the Lamellibranchia and Gastropoda, for a very large proportion of the species from Umkwelane Hill are identical with Pondoland species. In spite of obvious differences, due to the absence of certain common Pondoland species in the Zululand deposits, the faunas resemble each other rather closely.

Common Pondoland species have been met with at Incomanini on the Komati River in the neighbourhood of Delagoa Bay (du Toit, **16**, p. 327), but the fossils from this locality are not well known.* The fossils from the region between the Zambesi and Sabi Rivers in the central part of Portuguese East Africa, recovered by Teale and described by R. B. Newton (**44**), appear to represent a different facies.†

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* This fauna is not included in Table B.

† " Central Moçambique " in Table B.

Haughton (**26**) and the writer (**51**) have recently described a small collection of Upper Senonian species from the coast of Angola. The fauna is of very great interest, since several species are identical with Pondoland types, notably *Nordenskjöldia natalensis* and *Cardium denticulatum*, and the writer has concluded (**51**, pp. 6–9) that the continents bordering the Southern Atlantic had become separated by Campian times, allowing of free communication between Pondoland and Angola round the south of the African continent. The occurrence of " Atlantic " Ammonoidea in South-East Africa, and particularly at Umkwelane Hill, is thus accounted for.

Comparison has frequently been made between the Pondoland fauna and the faunas of the Ariyalur and Valudayur Beds in Southern India. It suffices here to repeat Woods' assertion (**77**, p. 344) that the resemblance between the faunas is due in the main to a similar assemblage of genera and the occurrence of a number of allied species. Although the Lamellibranchia and Gastropoda of the Umzamba Beds now number over 100 species, only 14 of these occur also in Southern India, and some of the latter are widespread species (e.g. *Neithea quinquecostata*, *Eriphyla lenticularis*). On the other hand, a very large proportion of the species are peculiar to the Umzamba Beds or to South-East Africa, so much so that it seems legitimate to regard South-East Africa (Pondoland, Zululand, and possibly Portuguese East Africa) as constituting a distinct Upper Cretaceous faunal province in the Indo-Pacific region.

The Upper Cretaceous deposits of Madagascar contain a fauna poor in Ammonoidea which resembles that of Southern India rather than that of Pondoland. The occurrence of *Potamides*, *Cerithium*, and other genera indicates an estuarine facies (see Cottreau, **6a**).

The exact age of the Umzamba Beds relative to the European succession is still rather doubtful. Spath (**59**, p. 116) accepted a Campanian plus Maestrichtian age for the Umzamba Beds, and believed that " the many large *Mortoniceras*, characteristic of South Africa, are pre-Maestrichtian " (**58**, p. 265). It has been pointed out above that there is no evidence for believing that more than one zone is represented in Pondoland ; in addition, the presence of the widespread *Pseudophyllites indra* admits of a very close correlation of the Umzamba Beds with deposits elsewhere in the Indo-Pacific region. The position has recently been summarised by Marshall (**35**, p. 199) in the following terms : " In the general account of his ' Geology,' however, Haug classes all those strata that contain the important fossils *Gaudryceras kayei* and *Pseudophyllites indra* in the Maestrichtian formation. These strata are in general those that have been classed as Senonian or Santonian or Maestrichtian by various authors. This point is at least apparent. All those strata that contain the two fossils named above are in all probability of the same age ; and, since those authorities that are familiar with the species consider that they are closely related to *Gaudryceras planorbiforme* and *Gaudryceras colloti*, it becomes equally certain that this formation is very high in the Cretaceous succession, perhaps even in the Maestrichtian. Included in this are the Ariyalur, Valudayur, Nanaimo, Lower Chico, Quiriquina, Seymour Island, New Zealand, and Pondoland Upper Cretaceous formations." While the Maestrichtian age has been accepted by Haug, van Hoepen (**65**, p. 45) is " inclined to regard the Pondoland Beds as of Upper Santonian age," and Marshall (**35**, p. 203) prefers " to take the Upper Santonian or the Lower Campanian as the more probable European equivalent " of the New Zealand deposits. On the whole, an Upper Campanian age for the Umzamba Beds appears to be most acceptable.

Spath (**58**, pp. 264–272) has drawn attention to the admixture of " Atlantic " and " Pacific " Ammonoidea in South-East Africa ; and Marshall (**35**, p. 201) has concluded from the absence of *Mortoniceras* and other " Atlantic " types in the faunas of Seymour Island (Antarctica) and New Zealand, that " South Africa derived its Indo-Pacific elements directly from India along the coast of the western Indian Ocean, and that there was no association with the countries at the south of the Pacific Ocean." This belief is greatly strengthened by the occurrence of Upper Senonian species in Angola with affinities with both North Africa and Pondoland, since it demonstrates that the South Atlantic had come into being by Campanian times and that there could not have been direct coastal communication between Pondoland and Seymour Island. Moreover, Pondoland and Seymour Island have no Lamellibranchia and Gastropoda in common. At the same time the coastal communication between Pondoland and Southern India may not have been as direct as Marshall seems to imply.

The molluscan fauna of the Umzamba Beds of Pondoland now totals over 160 species ; and since new species have been found in every collection that has so far been made, it is probable that the list will be extended in the future. It is to be remarked that in spite of the new collections, no Brachiopoda are yet known from the beds.

3. Specific Descriptions.

LAMELLIBRANCHIA.

Family NUCULIDAE.

Genus Nucula, Lamarck.

Nucula kaffraria, sp. nov.

(Pl. XVI, figs. 2–5.)

Material.—Three well-preserved valves showing little of the interior, two right and one left. Holotype, right valve, T. Mus., No. 1647; paratypes, T. Mus., Nos. 1645, 1646.

Description.—Shell triangular, convex, slightly compressed anteriorly. Antero-dorsal border long, almost straight, very slightly convex, postero-dorsal shorter, concave; ventral margin convex, meeting the postero-dorsal in a sharp angle; anterior extremity a rounded angle. Umbones prominent, curved slightly inwards and posteriorly, placed near the posterior end. Lunule * posterior, deep, broad, cordate, flattened, ornamented; escutcheon anterior, elongate, not distinct from the rest of the shell. Margins of valves coarsely crenulated within.

Ornamentation reticulate, of regular concentric ribs with interspaces broader than themselves, and radiating ribs. Towards the anterior the concentric ornamentation tends to predominate, and the radial ribs are separated by interspaces wider than themselves; towards the posterior and up to the bounding ridge of the lunule the radial ribs become stronger and closer together; on the lower part of the lunule the concentric ornamentation predominates, but towards the umbo there are a few strong, rounded, radial ribs.

	No. 1645.	No. 1646.	No. 1647.
Length . .	15 mm.	15 mm.	17 mm.
Height . .	12 ,,	11 ,,	14 ,,

Remarks.—In form and ornamentation this beautiful little shell is not unlike the Gault *N. pectinata* Sowerby (**76**, vol. i, p. 16), though the latter is readily distinguished by its wider and deeper lunule, its greater length, and by the fact that the concentric ornamentation is definitely subordinate to the radial. The Pondoland species appears to be more nearly related to *N. pulvillus* Müller (**28**, vol. xxxv, p. 201, pl. xxi, figs. 7, 8), but the antero-dorsal margin is straighter and the apical angle smaller than in the Aachen form.

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* For the use of the terms "lunule" and "escutcheon" in Nuculidae, see Woods, Mon. Cret. Lamell. of England, vol. i, p. 12.

FAMILY ARCIDAE.

Genus TRIGONOARCA, Conrad.

Trigonoarca elongata, sp. nov.

(Pl. XVI, figs. 6, 7.)

Material.—Holotype, T. Mus., No. 1635. Specimen with both valves preserved in part only, showing the area of the left valve, surface abraded.

Description.—Shell trapezoidal, moderately convex; considerably longer than high. Anterior margin convex, curving regularly and merging into the almost straight ventral margin. Umbones small, incurved, well in front of the middle; carina extending from the umbones to the very produced postero-ventral angle, rounded, the part posterior to it sloping rapidly to the posterior margin. Hinge-area moderately long, narrow, with few ligament grooves. Ornamentation of numerous radial ribs separated by very narrow grooves, crossed by numerous growth lines, the latter tending to be stronger ventrally and behind the carina.

Length (approx.), 55 mm.; height, 30 mm.

Remarks.—This species is considerably longer than any hitherto recorded from Southern Africa or from the deposits of Southern India, as well as being somewhat compressed in comparison with other members of the genus. Some specimens of *T. trichinopolitensis* (Forbes) (**62**, p. 353, pl. xix, fig. 2) approach it in length, but the Indian species seems always to be more convex than the present form, and to possess rather larger and more prominent umbones. *T. archiaciana* (d'Orbigny) (**13**, p. 235, pl. cccxxii) is very similar in proportions, but possesses a well-marked second carina posterior to the major one; this is a Turonian form.

Trigonoarca capensis (Griesbach).

(Pl. XVI, fig. 1.)

1871. *Arca capensis,* Griesbach: Q.J.G.S., vol. xxvii, p. 66, pl. iii, fig. 10.

1906. *Trogonoarca capensis,* Woods: Ann. S. Afr. Mus., vol. iv, p. 288, pl. xxxiv, figs. 1, 2.

Remarks.—The species has been well described by Woods, but the interior has not been figured. The Transvaal Museum collection contains an exceptionally fine specimen, No. 216, which shows the interior. The anterior adductor impression is large, subcircular, and placed close to the anterior end of the hinge. The posterior adductor impression is large and placed on a raised platform. Pallial line entire, with elongated muscle pits on the inner side. The interior should be compared with that of *T. angolensis* Rennie from Angola, described in a recent paper in these Annals (**51**).

Genus NORDENSKJÖLDIA, Wilckens.

Nordenskjöldia natalensis (Baily).

1855. *Arca natalensis,* Baily: Q.J.G.S., vol. xi, p. 461, pl. xiii, fig. 2.

1904. *Latiarca* (?) *natalensis,* Etheridge: Second Rep. Geol. Surv. Natal and Zululand, p. 77, pl. i, figs. 10–12.

1906. *Nemodon natalensis,* Woods: Ann. S. Afr. Mus., vol. iv, p. 289, pl. xxxiv, figs. 3–7.

1929. *Nemodon natalensis,* Rennie: Ann. S. Afr. Mus., vol. xxviii, p. 12, pl. iv, fig. 4.

Remarks.—The writer is indebted to Dr. S. H. Haughton for calling his attention to the resemblance between this well-known Pondoland species and Wilckens' genus *Nordenskjöldia* (**73**, pp. 26–30), which was formed to receive the two Indian species *Arca disparilis* d'Orbigny —the genotype—and *Arca japetica* Forbes (**62**, pp. 350–352), and a species from Snow Hill and Seymour Island, Antarctica, *N. nordenskjöldi* Wilckens (**73**, p. 26, pl. ii, figs. 8–11). *Nordenskjöldia* is probably allied to *Nemodon* Conrad, and is separated from it chiefly by reason of its stouter, more inflated, less elongated valves, much larger area, usually coarser radial ornamentation and marginal crenulations. The hinges of the genera are very similar, but the lateral teeth of *Nemodon* are longer and thread-like. For good figures of the genotype of *Nemodon*, *N. eufaulensis* (Gabb), and other species, see Wade (**67**, pp. 42, 43, pls. viii, ix).

The genus *Nordenskjöldia* is now known from the Ariyalur and Trichinopoli Groups of Southern India, South-East Africa, Southern Angola, and Antarctica. *Nemodon* appears to be confined to the eastern part of North America.

The Pondoland species was apparently overlooked by Wilckens when he described the genus.

Genus GLYCIMERIS, da Costa.

(=*Pectunculus*, Lamarck.)

Glycimeris cf. *subplanata* (Stoliczka).

(Pl. XVI, figs. 8–11.)

Material.—Two specimens, S.A. Mus., Nos. 8415, 8515.

Description.—Shell rather small, sub-orbicular, compressed, flattened towards the margins, longer than high, the greatest length at or a little above the middle. Umbones prominent. Margins rounded, the hinge margin tending to be straight for a short distance with feeble angulations at either end. Ligamental area very small, narrow, and rapidly descending. Surface with broad, flattened or slightly rounded, radiating ribs, separated by very narrow grooves, and with very faint traces of concentric ornament.

Remarks.—The description given above applies to the larger specimen, No. 8415, which differs from the common Pondoland species, *G. africana* (Griesbach) (**77**, p. 291, pl. xxxiv, figs. 8–12), in several respects. In the latter the shell is in all full-grown examples higher than long and the greatest length is below the middle, the anterior and posterior margins tend to slope towards the umbones, and the shell is stouter and more inflated, while the ribs tend to be narrow and on the posterior side unequal in size. The general aspect of the former suggests a comparison with Stoliczka's *Axinaea subplanata* (**62**, p. 347, pl. xvii, figs. 28–30; pl. xlix, fig. 10), and also with the figures given by that author of Forbes' *A. subauriculata* (**62**, p. 349, pl. xvii, figs. 31, 32), but not with Forbes' originals (**20**, p. 150, pl. xvii, fig. 13); but the figures given in the Pal. Indica are unfortunately lacking in clearness, and the details of the ornamentation can only be guessed at from the somewhat meagre description. *G. subplanata* seems to be most closely allied to the present species by reason of its rather compressed valves, its length, and the narrowness of the ligamental area, but the identification can be made certain only by an actual comparison of material from the two areas.

The shells described by Etheridge as *A. subauriculata* (Forbes) ? from the Umsinene River deposit, Zululand, are similar in outline but apparently more inflated (**18**, p. 75, pl. i, figs. 11, 12).

The ornamentation of *G. africana* appears to vary considerably, a phenomenon which may be due in part to variation in the state of preservation, and Woods has stated that young examples are more orbicular, as long as high, and with the greatest length about the middle ; hence the separation of young examples of the two Pondoland species would be a difficult matter. The smaller of the two specimens, No. 8515, though it agrees with the larger in outline and poor convexity, and should be referred with it to *G. subplanata,* shows a distinct resemblance to Woods' figure of a small example of *G. africana* (*op. cit.*, fig. 12), not only in shape but in the nature of the radial ornamentation.

FAMILY PINNIDAE.

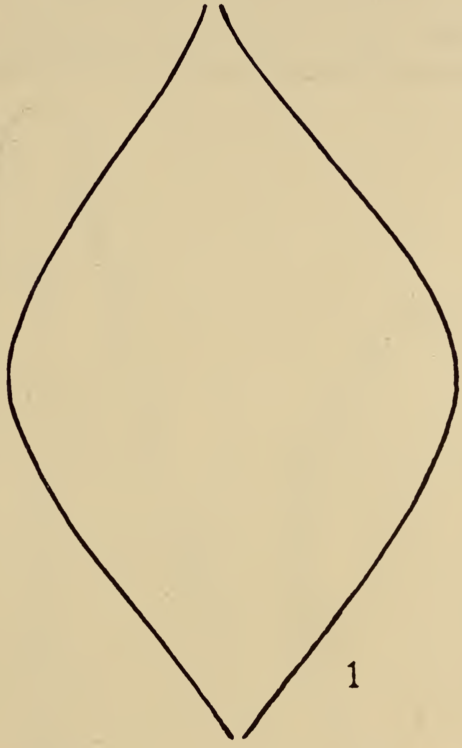
Genus PINNA, Linnaeus.

Pinna vanhoepeni, sp. nov.

(Pl. XVIII, fig. 9 ; text-fig. 1.)

Material.—The holotype, T. Mus., No. 1630, is a fine specimen with the valves closed, the anterior and posterior regions missing. Two fragments in the collection of the Durban Museum have also been examined.

Description.—Shell large, straight, well inflated, elongated. Margins nearly straight, the dorsal very slightly concave. Section quadrangular. Valves not fissured along the middle line, but each divided near the middle into two parts which meet at an angle. Dorsal part of each valve flattened and ornamented towards the umbones with about 7 rounded ribs, which are increased by intercalation to about 14, the secondary ribs remaining weaker than the primary. Ventral part of each valve slightly convex, becoming more flattened posteriorly, its dorsal portion ornamented with about 4 primary ribs, its median portion with about 4 weak secondary ribs. Ribs on all parts of the valve separated by broad, slightly concave interspaces ; ribs and interspaces crossed by fine, rather irregular, concentric ridges, which are closer together posteriorly, and on crossing the median secondary ribs of the ventral part of the valve, curve towards the umbones and are continued to the ventral margin, which they meet at an acute angle.



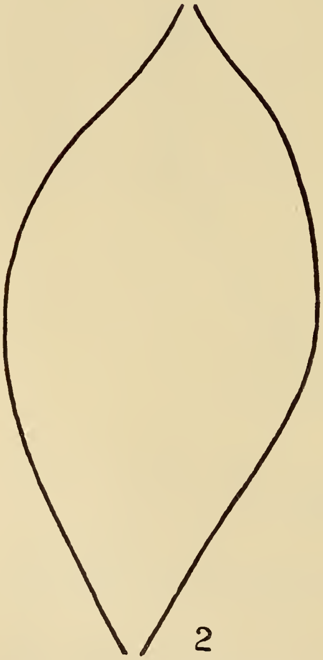
TEXT-FIG. 1.—*Pinna vanhoepeni,* sp. nov. Cross-section to show degree of inflation.

Remarks.—This species resembles *P. laticostata* Stoliczka (**62**, p. 385, pl. xxv, figs. 2, 3; pl. xxvi, fig. 4) from the Ariyalur Group of India in proportions and absence of the median fissure, and in the nature and disposition of the concentric ridges, but is at once separated from it by the intercalated secondary ribs, a feature which is seen also in the dorsal portions of the valves of *P. arata* from the Trichinopoli Group.

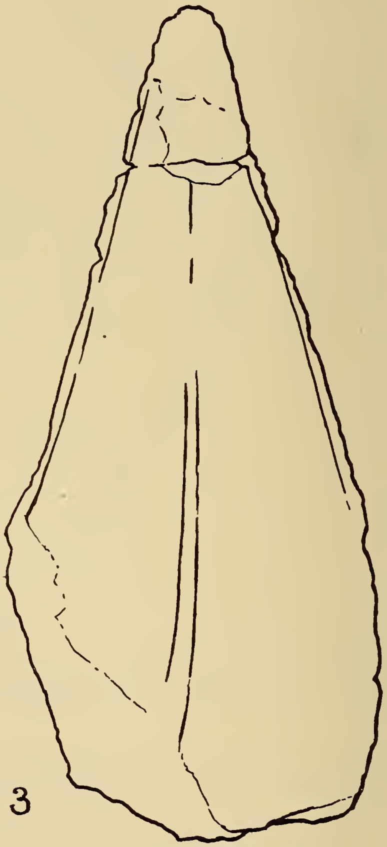
Pinna cf. *decussata*, Goldfuss.

(Pl. XIX, fig. 9; text-figs. 2, 3.)

Material.—One more or less complete specimen, considerably damaged posteriorly, with the surface of the left valve in a moderately good state of preservation, S.A. Mus., No. 8692, and a fragment of the dorsal part of another individual, S.A. Mus., No. 8443.



Text-fig. 2.—*Pinna* cf. *decussata*, Goldfuss. Cross-section to show degree of inflation.



Text-fig. 3.—*Pinna* cf. *decussata*, Goldfuss. Right valve. × ½.

Description.—Shell large, straight, elongated, not well inflated; margins nearly straight, the ventral rather convex; shell flattened posteriorly, apical angle small (35°). Valves not medially carinated but gently rounded, and fissured for their greater length. Dorsal part of the valve flattened, ornamented with about 7 ribs, the distance between which increases very gradually in passing towards the posterior. Dorsal portion of the ventral part of the valve ornamented with about 6 ribs, closer together than in the dorsal part of the valve, and diminishing in strength ventrally. Ventral portion of the ventral part of the valve ornamented with strong, curved growth lines and folds, which meet the last rib at an acute angle and do not appear to be continued across the ribbed portion of the valve—but this last character may be due to a certain degree of exfoliation. Shell thin.

Remarks.—This shell belongs to the group of *P. decussata* Goldfuss (**24**, vol. ii, p. 166, pl. cxxviii, figs. 1, 2 ; and **76**, vol. ii, p. 99, pl. xiii, figs. 4–6 ; pl. xiv, fig. 1) and *P. cretacea* (Schlotheim) ; the latter is a more elongated species with the ventral lines and folds less distinctly curved, as Woods has remarked (**76**, p. 101). The present specimen is more widely triangular, *i.e.* has a larger apical angle, than the forms figured by Goldfuss, but agrees with it in the character of the ribs and degree of inflation ; the concentric ornamentation is, however, not evident on the dorsal part of the Pondoland shell.

Stoliczka (**62**, p. 384) and Wilckens (**72**, p. 124) have indicated the relationship of *P. arata* Forbes (**62**, p. 384, pl. xxiv, fig. 5 ; pl. xxv, fig. 1 ; pl. xxvi, fig. 5) to *P. decussata*, the Indian species differing only in the presence of secondary ribs on the dorsal portions of the valves. Wilckens (**72**, p. 123, pl. v, fig. 2) has described a closely related species, *P. morenoi*, from the Upper Cretaceous of South Patagonia, which appears to be very close to the present species, but has a smaller apical angle.

FAMILY OSTREIDAE.

Genus OSTREA, Linnaeus.

Ostrea sp.

(Pl. XVII, figs. 1, 2.)

Material.—One large left valve, T. Mus., No. 1571. Probably also T. Mus., No. 1564, and two specimens in the collection of the South African Museum, Nos. 8555 and 8557.

Description.—Shell large, subcircular in outline, rather longer than high, compressed, more convex towards the centre, with a flattened bounding region. Exterior with strong growth markings at irregular intervals, and where well preserved with faint growth striae, and with obscure, discontinuous, radial plications giving the surface a roughened appearance; umbo pointed, small. Interior with a central, moderately concave region, higher than long, slightly produced posteroventrally, separated from the border by an obscure linear groove; this is bounded by a broad, flattened shelf, which commences on either side of the area as large, lateral, wing-like expansions, particularly wide on the posterior side, and is continued in rather narrower form round the ventral margin; near the umbo the shelf is covered with small, irregular ridges or crenulations. Area small, triangular, and ligament pit triangular, shallow. Muscular impression subcentral (relatively to the entire shell), but somewhat posterior (relatively to the central concave portion), subcircular.

The remaining specimens are of younger forms, and indicate that the juvenile shell was circular, smooth in outline, and without the flattened border.

Remarks.—This oyster resembles in form *O. nummus* Coquand (**5**, p. 136, pl. xliv, figs. 10–12) from the Cenomanian of France, a species in which the flattened bounding region is relatively narrower, the outline more nearly circular, and the surface smoother than in the present form. The Santonian, *O. licheniformis*, figured by Coquand (**5**, p. 91, pl. xxxvii, figs. 17–19) from France is not unlike the present form in some respects; but there again the bounding region is relatively narrower, especially in the upper part; this is regarded by Woods (**76**, vol. ii, p. 381) as a form of *O. semiplana* J. de C. Sowerby, in which the radial folds are usually more pronounced.

Genus Alectryonia, Fischer de Waldheim.

Alectryonia cf. *arcotensis* (Stoliczka).

(Pl. XVII, figs. 5–7.)

Material.—Two left valves, S.A. Mus., Nos. 8437, 8439.

Remarks.—These shells appear to be close to the forms described from the Ariyalur Group by Stoliczka as *Ostrea* (*Alectryonia*) *arcotensis* (**62**, p. 471, pl. xliii, figs. 3–7). The shells are small, subovate, slightly bent, rather convex; the surface is ornamented with several stout, subequal, rounded, radial ribs, which are separated by deep, rounded furrows; the margin is dentate; growth lines also occur; the adductor scar is large, bean-shaped, and placed towards the posterior border. The left valves figured by Stoliczka are provided with fewer and stouter ribs, and one of the Pondoland examples is more convex than any of the Indian forms, hence the hesitation in identifying the forms from the two regions.

A rather similar but larger specimen has been compared with the Indian forms by Wilckens (**72**, p. 125, pl. v, fig. 4); it is from the Upper Cretaceous of South Patagonia.

Genus EXOGYRA, Say.

Exogyra decussata, Goldfuss.

(Pl. XVII, figs. 3, 4.)

1834. *Exogyra decussata*, Goldfuss: Petref. Germ., p. 35, pl. lxxxvi, fig. 11.
1869. *Ostrea decussata*, Coquand: Mon. Genre Ostrea, p. 30, pl. vii, (with syn.).

Material.—Two left valves, S.A. Mus., Nos. 8562, 8578.

Description.—Left valve convex, elongate-oval in outline, inequilateral, margins rounded. Umbo curved inwards and backwards, distorted by a circular area of attachment. Strong carina extending in a curve from the umbo to the postero-ventral extremity, dividing the shell into a more or less flattened posterior region and a slightly rounded anterior. Surface with coarse growth markings, and near the carina with irregular radial folds or ridges.

Remarks.—The writer does not hesitate to place these specimens in the species created by Goldfuss, a species which is widespread in the Upper Senonian of Europe and has also been found in N. Africa. The high carina and radial ribs are characteristic. The species does not appear to have been found in India, though a similar species, *E. ostracina* (Lamarck), is common in the Ariyalur Group (**62**, p. 459, pl. xxxv, figs. 6–12; pl. xxxvi, figs. 1–4).

FAMILY PECTINIDAE.

Genus PECTEN, Müller.

Sub-genus CAMPTONECTES, Meek.

Pecten (*Camptonectes*) *kaffraria*, sp. nov.

(Pl. XVI, figs. 12–15.)

1906. *P.* (*Camptonectes*) *sp.*, Woods: Ann. S. Afr. Mus., vol. iv, p. 297, pl. xxxv, figs. 12, 13.

Material.—Six specimens, T. Mus., Nos. 1598–1603. Types, Nos. 1601 (left valve) and 1602 (right valve).

Description (after Woods).—Right valve ovate, slightly inequilateral, with the dorsal third pointed, and the margin of the remaining part forming a regular curve. Antero-dorsal margin rather longer than the postero-dorsal.

Ornamentation consists of numerous fine radial furrows. Near the median part of the valve the furrows are nearly straight and often discontinuous; they are separated by broad, flat interspaces on which fine concentric lines may occur. On the anterior and posterior parts of the valve the furrows become more curved, deeper, and more continuous, and the interspaces become narrower, more raised, and rib-like. The furrows do not show punctae.

Anterior ear large, with its anterior margin nearly at right angles to the hinge line, ornamented with fine ridges parallel with the anterior margin; byssal sinus of moderate size. Posterior ear smaller than the anterior, with its outer angle obtuse, ornamented with fine radial ribs and growth-ridges.

Left valve with ornamentation similar to, but rather coarser than, that on the right valve. Anterior ear large, with its outer angle nearly rectangular. Posterior ear smaller than the anterior, with its outer angle obtuse.

Length, 17 mm.; height, 19 mm.

There is nothing to add to this description. Most of the specimens are considerably larger than that described by Woods. The measurements of No. 1601, with the ventral margin restored, are: length, 34 mm.; height, 35 mm. No. 1600 would, when complete, have approximately the following dimensions: length, 54 mm.; height, 57 mm.

Remarks.—Woods states that the specimens examined by him belong to the same type as *P. virgatus* Nilsson, but appear to differ in having finer ornamentation, and resemble most nearly the example figured by Römer from Texas as *P. virgatus*. With more material from Pondoland at hand, it is possible to state that the ornamentation is very much finer than in the Swedish species, and that it is extremely unlikely that the present examples belong to the same species as the small type figured by Nilsson (**45**, p. 22, pl. ix, fig. 15) and Hisinger (**27**, p. 52, pl. xvii, fig. 3). In the case of the shell figured by Römer from Texas (**53**, p. 66, pl. viii, fig. 5), the ornamentation is certainly coarser than in any of the present specimens, and, moreover, there appears to be a more pronounced system of fine concentric lines. Under the circumstances it is desirable to have a new specific name for the Pondoland forms.

The absence of punctae in the furrows, combined with the exceedingly fine ornamentation, separates the shells at once from *P. striato-punctatus* Römer and *P. curvatus* Geinitz (**76**, vol. i, pp. 157–162).

Genus NEITHEA, Drouet.

Neithea quinquecostata (Sowerby).

(Pl. XVIII, figs. 1–5.)

1814. *Pecten quinquecostata*, J. Sowerby: Min. Conch., vol. i, p. 122, pl. lvi, figs. 4–8.
1903. „ (*Neithea*) *quinquecostatus*, Woods: Cret. Lam. England, vol. i, p. 202, pl. xxxix, figs. 14–17; pl. xl, figs. 1–5 (with full synonymy).
?1904. *Neithea sp.*, R. Etheridge, jr.: Second Rep. Geol. Surv. Natal and Zululand, p. 73, pl. ii, fig. 13.
1906. *Pecten* (*Neithea*) *quinquecostatus*, Woods: Ann. S. Afr. Mus., vol. iv, p. 298, pl. xxxv, fig. 14.
1907. *Neithea quinquecostata*, R. Etheridge, jr.: Third Rep. Geol. Surv. Natal and Zululand, p. 70, pl. iv, figs. 8, 9.
1909. „ „ R. Bullen Newton: Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 58, pl. iii, figs. 1, 2.

Remarks.—This ubiquitous species has been recorded from the

Umzamba Beds in Pondoland, and in Zululand from the Manuan Creek area, the Umsinene deposit, and Umkwelane Hill; the South African Museum possesses a damaged right valve from Angola which has recently been described in these Annals by the writer (**51**).

Woods figured only the exterior of a right valve from Pondoland. The collections made by Dr. Gevers includes several well-preserved specimens of both valves, including a small right valve (No. 8420), in which the concentric striations are preserved with exceptional clearness. The writer has also had the opportunity of examining a larger right valve, in which the rather remarkable structure of the hinge-plate is seen to perfection; this beautiful specimen is in the collection of the Durban Museum.

Hinge-plate in Neithea.—The following is a description of the hinge-plate of the Durban specimen. Ears subequal, triangular; dorsal edges of the ears straight, horizontal, and somewhat thickened; lateral edges straight, vertical, thin, and sharp. Hinge-line provided with a row of well-developed transverse denticles, which are in appearance remarkably like the teeth of a taxodent shell. Ears slightly concave and smooth below the hinge-line; the posterior ear provided with two ridges on the ventral part, placed obliquely, and subparallel to one another, the lower one being the distal end of the auricular crura. Resilium pit deep, triangular, with the umbo arched over its dorsally pointed end. On each side of the pit is a very stout, elevated, laterally compressed, elongated, tooth-like process; the ventral end of each tooth is thickened and projects below the margin of the hinge-plate; each tooth thins out and becomes less elevated dorsally, but the ends are curved round immediately beneath the umbo into two small, projecting, tooth-like tubercles.

A specimen of a left valve in the collection of the South African Museum (No. 8380) shows two small plate-like outgrowths which project upwards from the hinge-line on either side of a median notch; immediately below each plate is an oblique slit. When the valves are united the notch evidently receives the tip of the highly incurved right umbo, and the plate-like outgrowths fit into the sockets above the large tooth-like processes of the right valve, the latter fitting into the slits below the plates on the left valve.

The interior of the right valve of *Neithea* has seldom been figured. The only figures seen by the writer in which the interior is clearly shown are included among the unusually fine figures given recently by Wade (**67**, p. 64, pl. xxi, figs. 1–5) of specimens from the Upper Cretaceous of Tennessee. These are quite typical examples of

N. quadricostata (Sowerby), but are erroneously referred to *N. quinquecostata* (Sow.), which is placed under *Pecten* without reference to the *Neithea* group. The figures demonstrate fairly clearly in both valves the structures described above for the allied *N. quinquecostata*, though the resilium pit of the right valve is hidden by the arching of the umbo.

Dall (**11**, p. 690) makes the following observations on the hinge-plate of *Pecten* : " The ends of the resilium are received by subtriangular or oval pits in the umbonal region. These pits may be shallow or deep ; their basal margin sometimes projects slightly into the cavity of the valves ; their apex is always nearly coincident with the umbonal point of the valve. In a few species, in the right valve, the lateral margins of the pit are raised into tooth-like processes, which fit into corresponding depressions in the opposite valve (e.g. *P. swiftii* Bernh.), but these are not homologous with the so-called teeth of *Plicatula* and *Spondylus*. Outside of these, radiating fan-like from the apex of the valve, are frequently found one to three pairs of more or less prominent laminae, which I call the cardinal crura, and further away and below, on the ridges which mark the lower boundary of the ears, will sometimes be found another pair, only distally conspicuous, which I have named the auricular crura. The cardinal crura are most conspicuous in heavy shells, especially such as *Pecten* proper and *Lyropecten*, and serve to adjust the closing of the valves, as does the hinge armature of the Teleodonts. In a few species the crura are sufficiently prominent to actually interlock with the valves half open ; in many others hardly any trace of them is visible."

Excellent figures of various species of *Pecten* showing the cardinal crura (" cardinal ribs ") and auricular crura have been given by Verrill (**68**, p. 51, pl. xix, figs. 6–9).

Concerning *Spondylus*, Dall (**11**, p. 494) makes the following statement : " It is through a study of the *Pectens* and very young *Spondyli* that I have been able to satisfy myself that the so-called teeth of *Spondylus* (and of some Pectiniform relatives) are not homologous with either Prionodont or Teledont teeth, but are a modification of certain ridges which reinforce the auricles in many Pectens and which I named, in 1886, the auricular crura. I have been able to trace this modification of the crura to a point where it absolutely harmonises with the incipient teeth of *Spondylus* at an age when the original arca-like teeth of *Pecten* and *Spondylus* still occupy the cardinal margin."

In the opinion of the writer, the large tooth-like processes which flank the resilium pit in both *N. quinquecostata* and *N. quadricostata* are modifications of the dorsal ends of the auricular crura. They are therefore homologous with the crural teeth of *Spondylus* and *Plicatula.* If the tooth-like flanking processes quoted by Dall in the case of *P. swiftii* are of the same nature as those seen in *Neithea,* then the writer is unable to understand the distinction between them and the crural teeth of *Spondylus.* Dall states that *P. swiftii* is close to *Pecten* (*Chlamys*) *parmeleei* Dall from the American Pliocene (**11**, p. 708), so it is evidently rather different from *Neithea.*

The genus *Neithea* differs in several points from the other Pectens, notably in the development of crural teeth and the retention of well-developed denticles on the hinge-line. The auricular crura of the true Pectens cannot be called tooth-like, except perhaps in the case of *P. swiftii,* and well-developed denticles on the hinge-line occur only in juvenile forms, being obsolete or quite absent in the adult. The strong arching of the right valve, the ornamentation, and the remarkably efficient articulation, make this a very distinct genus.

It is concluded that *Neithea* should be placed somewhat apart from *Pecten* and its numerous subdivisions (*Chlamys*, *Camptonectes*, etc.). The striking development of the crural teeth shows a remarkable parallel with the Spondylidae. It may be remarked, however, that the type of *Neithea* is *N. aequicostata* (Lamarck), the hinge of which does not appear to have been seen. This view is a departure from the opinions of former workers ; Fischer (**19**, p. 946), Verrill (**68**, p. 60), and Dall (**81**, p. 457) have regarded *Neithea* as a section of *Pecten* (*sensu stricto*), the type of which is *P. maximus* Linnaeus.

FAMILY SPONDYLIDAE.

Genus SPONDYLUS, Linnæus.

Spondylus cf. *calcaratus*, Forbes.

(Pl. XX, figs. 5–7.)

Cf. 1846. *S. calcaratus,* Forbes : Trans. Geol. Soc. Lond., vol. vii, p. 155, pl. xviii, fig. 2.
Cf. 1846. *S. subsquamosus,* Forbes : *Ibid.*, p. 154, pl. xviii, fig. 1.
Cf. 1871. *S. calcaratus,* Stoliczka : Cret. Pel. S. India, p. 448, pl. xxxiii, figs. 6, 7, 9, 10.
Cf. 1906. ,, Boule and Thevenin : Ann. de Pal., vol. i, p. 49.

Material.—Three large upper (left) valves in moderately good condition and showing the hinge-line, but somewhat worn externally, and a single right valve affixed to one of these; T. Mus., Nos. 1567–69, also, doubtfully, T. Mus., No. 1566.

Description.—Left valve large, thick, moderately inflated, ovate, higher than long, very slightly inequilateral. More or less pointed in the umbonal region, ventral and lateral margins well rounded. Surface irregular, undulating. Ears small, worn in the specimens, the posterior slightly larger, separated by a deep fold and rounded ridge from the rest of the shell, with fine radial ornamentation. Smooth or irregularly toothed within the central margin. Ornamentation of very numerous radiating ribs, rounded or laterally compressed, separated by deep grooves which may be narrower than or as wide as the ribs, both ribs and grooves being crossed by numerous growth striae which give to the ribs a faintly rugose appearance. Hinge stout, area triangular, with a deep median ligament groove.

Right valve attached by most of its surface, free parts with poorly developed radial ribs and strong growth striae. Inner surface with radial grooves corresponding to the external ribs, and with toothed ventral margin. Umbonal part much produced and strongly curved anteriorly, with large pointed area.

Remarks.—*S. calcaratus* seems to be a very variable species. The specimens differ considerably in the degree of convexity of the left valve and spacing of the radial ribs, and none of them show the presence of a few stronger ribs and the scale-like tubercles seen in most (but not all) of the Indian forms described by Forbes and Stoliczka from the Trichinopoli Group. Nevertheless the Pondoland shells should be referred at least tentatively to the Indian species, with which they agree in proportions, nature of the ribbing, and the curious twisting of the umbonal regions of the fixed valve. The species seems to be very close to the European *S. truncatus* Goldfuss (**13**, p. 666, pl. cccclix).

Family LIMIDAE.

Genus Lima, Bruguière.

Sub-genus acesta, H. and A. Adams.

Lima (*Acesta*) *obliquistriata*, Forbes.

(Pl. XIX, figs. 7, 8.)

1846. *Lima obliqui-striata*, Forbes: Trans. Geol. Soc. Lond., vol. vii, p. 154, pl. xviii, fig. 13.

1871. *Radula* (*Acesta*) *obliqui-striata*, Stoliczka : Cret. Pel. S. India, p. 421, pl. xxx, figs. 2–5, 13.

Material.—An incomplete left valve, T. Mus., No. 1631. The Durban Museum possesses two specimens, somewhat worn.

Description.—Shell compressed, considerably higher than long, moderately oblique. Anterior margin straight, ventral well rounded ; postero-dorsal and postero-ventral margins moderately convex, and meeting in a rounded angle above the middle. Umbones pointed, small, placed close to the anterior margin. Apical angle about 70°. Anterior ear small, narrow, separated from the shell by a deep depression ; posterior larger, oblique, well marked off from the rest of the shell. Anterior area very narrow, depressed, elongate, limited by a sharp edge from the rest of the shell.

Ornamentation of numerous rounded ribs, somewhat flattened, separated by grooves narrower than themselves ; the ribs increase in size from the umbo ventrally without increase in number. Surface with concentric growth lines, which cross ribs and grooves alike, on the posterior side somewhat obliquely ; and with more prominent growth ridges at irregular intervals.

Length, 32 mm. ; height, 50 mm.

Remarks.—This species seems to be identical with that from the Ariyalur Group described by Forbes and Stoliczka, with which it agrees in shape and ornamentation. Stoliczka states that the ribs when well preserved are ornamented with numerous spinulose scales ; in the Pondoland specimens the best-preserved ribs have a somewhat scaly appearance due to the crossing of the growth lines. It resembles most *L. rauliniana* and *L. ornata* of d'Orbigny, as remarked by Stoliczka, but is distinguished from the former by having fewer and more closely set ribs, and from the latter by its more closely set ribs and finer scales.

Family MYTILIDAE.

Genus Modiola, Lamarck.

Modiola typica (Forbes).

(Pl. XIX, figs. 1–6.)

1846. *Mytilus* (*Modiolus*) *typicus*, Forbes : Trans. Geol. Soc. Lond., vol. vii, p. 152, pl. xiv, fig. 4.

1866. *Modiola typica,* Zittel: Biv. der Gosaugeb., p. 78, pl. xi, fig. 5.

1871. ,, Stoliczka: Cret. Pel. S. India, p. 377, pl. xxiii, figs. 12–15.

Material.—Two fine specimens, T. Mus., Nos. 1595, 1596; three small forms, apparently young specimens of the same species, T. Mus., Nos. 1597, 1598. Also South African Museum, Nos. 8535, 8619, 8675.

Description.—Shell elongate-oval, curved; anterior and posterior rounded; ventral margin gently concave. Shell well inflated, the part of greatest convexity represented by a rounded ridge extending from the umbones to the postero-ventral extremity, curved, flanked on the anterior side by a slight depression. Dorsal margin straight. Umbones obtuse, touching, anterior. Anterior margin produced slightly beyond the umbones. Ornamentation of sharp, somewhat irregular, concentric ribs and faint concentric striae, the ribs being stronger on and posterior to the ridge of greatest convexity. A bundle of faint radial striae extends from the umbones postero-ventrally along the anterior flank of the ridge.

Remarks.—The above description is of the large specimens. There are in addition three small specimens which appear to be young forms of the same species. These show some variability in shape and strength of the concentric ornamentation and do not appear to possess the fine radial striae towards the middle seen in the typical specimens, but do not possess characters sufficiently marked to lead one to regard them as a different species. They are shorter and less inflated towards the umbones than *M. kaffraria* Woods (**77**, p. 294, pl. xxxv, fig. 5) from the same deposits.

M. reversa Sowerby (**76**, vol. i, p. 94, pl. xv, figs. 15–18; pl. xvi, figs. 1–3) is closely allied, but the ridge of greatest convexity appears to be more marked and less gently rounded than in *M. typica,* while its radiating striae are confined to the shallow sulcus anterior to the ridge, whereas in *M. typica* they are situated on the anterior slope of the ridge.

FAMILY PLEUROMYIDAE.

Genus PLEUROMYA, Agassiz.

Pleuromya africana (R. Etheridge, jr.).

(Pl. XX, figs. 8–10.)

1907. *Myopsis* (?) *africana*, R. Etheridge, jr.:	Third Rep. Geol. Surv. Natal and Zululand, p. 81, pl. i, figs. 9, 10.
1909. *Pleuromya africana*, R. Bullen Newton:	Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 84, pl. viii, figs. 1–3.

Material.—Two well-preserved specimens with the valves closed, T. Mus., Nos. 1657, 1658.

Description.—Shell elongate-oblong, inequilateral, convex. Umbones prominent and incurved. Anterior margin rounded, ventral margin convex, the posterior region produced and compressed with rounded margin. Greatest convexity in front of the umbones; an obscure carina extends from the umbones to the antero-ventral margin, cutting off a rapidly sloping antero-dorsal part. Shell thin, with small anterior and posterior gapes. One specimen has a large part of the shell removed and shows the large pallial sinus, very broadly rounded, and the relatively small, rounded, posterior adductor impression. The dorsal margins posterior to the umbones differ in the two valves, the right overlapping the left, the left being modified for that purpose by being flattened or bevelled along the margin.

Ornamentation of concentric sulcations and rounded ridges, the grooves being rather narrower than the ridges, and of irregularly distributed growth lines, the concentric ornamentation tending to be finer near the umbones. The entire surface of the shell is covered with minute granulations, scattered for the most part in haphazard manner, but with a tendency to arrangement in radial lines. At the posterior end there are in some specimens minute, irregular, radial riblets or wrinklings.

The measurements of the more complete specimen, which agree with those given by Bullen Newton, are as follows:—

Length	45 mm.
Height	27 ,,
Thickness	21 ,,

Remarks.—This species was referred by Bullen Newton to *Pleuromya*, and compared with *Pholadomya neocomiensis* Leymerie and *Myopsis unioides* Agassiz, both of which are regarded as synonymous with *Panopea gurgitis* (Brogniart) by Woods (**76**, vol. ii, p. 222). The resemblance of the present species to some forms of *P. gurgitis* is based on superficial characters, shape, concentric corrugations, and on the presence of the minute granulations, and not on the characters of the hinge, which has not been seen in the present species. The overlapping of the dorsal margin of the left by that of the right valve at once separates *P. africana* from *P. gurgitis*, and strongly supports Newton's placing of the species in *Pleuromya*. The type is from the Umsinene deposit (Zululand), and the species occurs also at Umkwelane Hill and in the Manuan Creek area.

A similar species is *Panopea* ? (*Pleuromya* ?) *clausa* Wilckens from Antarctica (**73**, p. 68, pl. iii, fig. 10).

FAMILY PHOLADOMYIDAE.

Genus PHOLADOMYA, G. B. Sowerby.

Pholadomya umzambiensis, sp. nov.

(Pl. XX, figs. 13, 14.)

Material.—The species is founded on a single specimen with the valves closed ; though somewhat weathered and in the form of a cast, the form and ornamentation are indicated sufficiently well to justify its description as a new species. S.A. Mus., No. 8475.

Description.—Shell small, elongate, medially inflated, posteriorly expanded and compressed. Umbones small, moderately prominent, incurved, continuous, placed well in front of the middle. Dorsal margin long, straight; anterior margin well rounded and merging gradually into the moderately convex ventral margin ; posterior apparently truncate, but may have been evenly rounded. Shell probably very thin. Ornamented with numerous (about 35), relatively strong, radiating ribs, which are towards the anterior separated by rounded interspaces wider than themselves, and towards the posterior more closely crowded ; the ribs cover the entire shell, except for a very small antero-dorsal area and a narrow postero-dorsal area.

Remarks.—The species differs from other Upper Cretaceous species by reason of its small size and numerous ribs spread over most of the shell.

Pholadomya cf. *elliptica*, Münster.

(Pl. XX, figs. 11, 12.)

Cf. 1839. *P. elliptica*, Münster : Goldfuss' Petr. Germ., vol. ii, p. 273, pl. clviii, fig. 1.
Cf. 1843. *P. royana*, d'Orbigny : Pal. Franç., Terr. Crét., vol. iii, p. 360, pl. ccclxvii.
Cf. 1874. *P. elliptica*, Moesch : Mon. der Phol., Mém. Soc. Pal. Suisse, p. 104, pl. xxxiv, figs. 3, 4.
Cf. 1912. ,, Pervinquière : Pal. Tunis., Gastr. et Lam. Crét., p. 289 (with syn.).

Material.—A single fairly well-preserved specimen with the valves closed, T. Mus., No. 1586.

Description.—Shell thin, moderately inflated, elongated. Umbones inflated, moderately prominent, placed towards the anterior. Anterior slightly produced with rounded margin ; posterior produced. Ornamented with eight radiating, widely separated ribs, which are absent from the anterior and posterior ends of the shell ; and with strong concentric growth rings.

Remarks.—This seems to be very close to the European species ; the resemblance to the fig. 3 of Moesch and the fig. 3 of d'Orbigny is particularly evident—these being varieties with comparatively few ribs. *P. elliptica* is widespread in the Santonian and Campanian of Northern Africa, France, and elsewhere in Europe.

Genus GONIOMYA, Agassiz.

Goniomya umzambiensis, sp. nov.

(Pl. XX, figs. 1–4.)

1906. *Goniomya sp.*, Woods : Ann. S. Afr. Mus., vol. iv, p. 310, pl. xxxvii, fig. 9.

Material.—Three specimens, one retaining portions of the test. Holotype, T. Mus., No. 1588 ; paratypes, T. Mus., Nos. 1587, 1589.

Description.—Shell small, elongate-oblong, moderately convex, inequilateral. Anterior moderately produced, the margin rounded, the antero-dorsal margin making an angle of about 45° with the ventral. Ventral margin straight. Posterior produced, truncate and gaping ; posterior margin oblique, forming an acute angle with the ventral margin. Umbones moderately prominent with an obscure carina extending postero-ventrally, separating a compressed ribless area from the rest of the shell. Lunule and escutcheon elongate and very narrow. Ornamentation of prominent ribs and faint concentric striations ; anterior to the umbones is a ribbed area on which the ribs extend obliquely backwards ; posterior to the umbones are ribs extending obliquely backwards and more or less parallel to the posterior margin ; the anterior and posterior ribs are connected by less well-developed horizontal ribs, which are very slightly concave to the ventral margin and meet the anterior and posterior ribs at sharp angles ; where the horizontal median ribs are very poorly developed, the shell appears to be ribless towards the centre.

Remarks.—This species resembles in form and ornamentation several species from rather lower horizons in Europe. *G. archiaci* (Pictet and Renevier) from the Lower Greensand is relatively shorter, and the posterior ribs are nearly vertical and curve round to meet the horizontal median ribs (**76**, vol. ii, p. 254, pl. xlii, figs. 4, 5). In *G. rauliniana* (d'Orbigny) (**13**, p. 353, pl. ccclxiii, figs. 4, 5), from the Albian of France, the posterior ribs are placed obliquely forwards, while *G. caudata* Agassiz=*Ph. agassizi* d'Orbigny (**13**, p. 352, pl. ccclxiii, figs. 1, 2) is not so markedly truncate posteriorly and has the posterior ribs curved.

The genus does not appear to have been recorded from the Cretaceous of Southern India.

Family ANATINIDAE.

Genus Cercomya, Agassiz.

Cercomya arcuata (Forbes).

(Pl. XVIII, fig. 6.)

1846. *Anatina arcuata*, Forbes : Trans. Geol. Soc. Lond., vol. vii, p. 143, pl. xvi, fig. 5.
1871. *Anatina* (*Cercomya*) *arcuata*, Stoliczka : Cret. Pel. S. India, p. 78, pl. iii, fig. 1.
1906. ,, ,, ,, Boule et Thevenin : Ann. de Pal., vol. i, p. 50, pl. i, fig. 7.
1923. *Cercomya* cf. *arcuata*, Bullen Newton : Trans. Geol. Soc. S. Afr., vol. xxvi, pp. 148–9.

Material.—A single right valve, in the condition of a cast but with portions of the shell adhering, T. Mus., No. 1655.

Description.—Shell elongate, moderately compressed, inequilateral, highest in front of the umbones, tapering posteriorly. Anterior compressed, the margin broadly rounded. Posterior produced, narrow, with two carinae extending to the extremity from the inconspicuous umbo. Dorsal margin moderately concave, the ventral almost straight. Ornamented with distant, rounded, concentric folds and faint concentric striae, the folds not continued across the posterior carinae ; and with radial rows of minute tubercles.

Remarks.—The resemblance to the figure given by Stoliczka of a specimen from the Valudayur group is very great, and there can hardly be any doubt as to the identity of the two forms. The ornamentation of radial rows of minute tubercles, which seems to be characteristic of the genus, was not noticed by Stoliczka. The species has been recorded by Boule and Thevenin from Madagascar, and by R. Bullen Newton from Portuguese East Africa.

FAMILY POROMYIDAE.

Genus LIOPISTHA, Meek.

Section PSILOMYA, Meek.

Liopistha (*Psilomya*) *corrugata*, Woods.

(Pl. XXI, figs. 1–4.)

1906. *L.* (*Psilomya*) *corrugata*, Woods : Ann. S. Afr. Mus., vol. iv, p. 309, pl. xxxvii, figs. 10–12.

Material.—Species founded by Woods on three internal casts in the Museum of the Geological Society of London. The numerous specimens seen by the writer show that the types are juvenile forms and consequently that the description must be considerably augmented.

Transvaal Museum, Nos. 1640–1644, 1648, 1653, 1691.

South African Museum, Nos. 8536, 8537, 8599, 8680, 8694, 8710.

Among the Transvaal Museum specimens are four adult forms with the shell beautifully preserved and several juvenile casts.

Description.—Shell oval, slightly inequilateral, inflated, rather longer than high ; margins rounded anteriorly and posteriorly, ventral margin gently curved. Umbones prominent, curved inward and slightly forward. Shell surface nearly smooth in the main, with faint growth lines, but ornamented towards the umbones with rounded concentric ribs or corrugations ; these corrugations disappear with the growth of the shell (*i.e.* are only formed in the younger stages) and are more marked in the casts than in those specimens which retain the test ; there is a certain amount of variability in the strength of these corrugations, and some examples seem to lose them at an earlier stage than others. The surface of the shell is covered with radial rows of minute pits, these being most marked towards the periphery, and finest and closest together on the dorsal region posterior to the umbones, and often completely absent from the central parts of the shell. There seems to be a very shallow groove extending posteriorly from the umbo, parallel to the postero-dorsal margin.

Remarks.—This seems to be a very distinct species. The dorsal corrugations are analogous to those of the otherwise very different English species, *L. gigantea* (Sowerby), but are more strongly developed. The Indian species of the same age (Ariyalur Group), *P. globulosa* Forbes, does not possess the corrugations at all, and is more truncate posteriorly.

FAMILY CYPRINIDAE.

Genus VENIELLA, Stoliczka.

Veniella drui (Munier-Chalmas).

(Pl. XXI, figs. 5–9.)

1881. *Roudaireia drui*, Munier-Chalmas : Mission des Chotts, p. 76, pl. iv, figs. 1–7, and pl. v, fig. 1.
1912. *Roudaireia drui*, Pervinquière : Pal. Tunis, Gastr. et Lam. Crét., p. 230, pl. xv, figs. 9–13.
1917. *Roudaireia auressensis*, Fortau : Geol. Surv. Egypt, Pal. Ser., No. 3, p. 63 (with syn.).
1926. *Veniella drui*, Wade : U.S.G.S. Prof. Paper 137, Fauna Ripley Form. Tenn., p. 77.

Material.—Three right valves in the Transvaal Museum Collection, Nos. 1632–1634, one showing the complete hinge. There are two right valves in the collection of the South African Museum, Nos. 8538 and 8474, and two in the collection of the Durban Museum.

Description.—Shell triangular, oblique, higher than long. Umbones prominent, incurved and anteriorly directed. Posterior margin slightly convex or sometimes nearly straight, meeting the ventral margin in an acute angle; ventral margin straight or nearly so; anterior margin well rounded. Lunule flattened, bounded by an impressed line. A remarkably high carina extends from the umbones to the produced postero-ventral angle, dividing the surface of each valve into a rounded, convex anterior and a flattened, rapidly sloping posterior. An obscure keel runs for a short distance from the umbones on the posterior region, about midway between the carina and the postero-dorsal margin.

Hinge stout; in the right valve with three cardinals; the posterior long, oblique, not bifid, laterally compressed; the median small, tubercle-like, placed obliquely above the anterior; anterior stouter than the median and separated from it by a deep groove. Nymph stout, elongated. Posterior lateral long, with a long groove above it for the reception of the corresponding tooth of the left valve.

Surface of the valve with irregular concentric sulcations and growth lines, finer behind the carina.

Remarks.—These Pondoland forms agree in all particulars with the Tunisian examples so well described by Munier-Chalmas. The writer has described and figured an example from the Baba district of Angola, near Mossamedes, in a recent paper in these Annals (**51**).

Cyprina cristata Stoliczka (**62**, p. 198, p. ix, fig. 1), from the Ariyalur Group, known only from the single specimen figured by Stoliczka, may well be a young example of this or an allied species.

Veniella forbesiana (Stoliczka).

(Pl. XXI, fig. 10.)

1871. *Cyprina forbesiana*, Stoliczka: Cret. Pel. S. India, p. 197, pl. ix, figs. 2–8.
1905. *Roudaieria forbesiana*, Choffat: Nouvelles données, Angola, p. 42, pl. 1, fig. 3.
1912. ,, ,, Pervinquière: Pal. Tunis, Gastr. et Lam. Crét., p. 232, pl. xv, figs. 14, 15.
1909. *Veniella forbesiana*, R. Bullen Newton: Trans. Roy. Soc. S. Afr., vol. i, p. 67, pl. vii, figs. 1–4.

Remarks.—There is a cast of a small example of this species in the collection, T. Mus., No. 1590. It agrees exactly with some beautifully preserved small shells from Zululand, in the collection of the South African Museum, described in the Appendix to this paper.

FAMILY ASTARTIDAE.

Genus ASTARTE, Sowerby.

Astarte ? amapondensis, sp. nov.

(Pl. XVIII, figs. 7, 8.)

Material.—One specimen with the valves closed, very well preserved, S.A. Mus., No. 8639.

Description.—Small, rounded, compressed, about as long as high. Umbo small, moderately prominent, pointed, curved slightly forwards, and placed a little in front of the middle. From the umbo a straight furrow extends to a sinuosity in the middle of the posterior margin, cutting off a very much compressed postero-dorsal area. A similar but somewhat curved furrow extends from the umbo to an angulation of the anterior margin, cutting off a small laterally compressed area. Surface of each valve with six well-marked, flattened, concentric lamallae, the interspaces between which are covered with minute concentric striations.

Remarks.—The species apparently belongs to *Astarte*, but is quite distinct from *A. griesbachi* from the same deposit (**77**, p. 300, pl. xxxv, figs. 18, 19).

FAMILY CRASSATELLITIDAE.

Genus CRASSATELLITES, Krüger.

Crassatellites haughtoni, sp. nov.

(Pl. XXI, figs. 12, 13.)

Material.—The holotype is a well-preserved left valve, S.A. Mus., No. 8429.

Description.—Shell subquadrangular, moderately convex, longer than high. Umbonal region moderately inflated ; the umbo prominent, curved forward, placed in front of the middle. From the umbo a well-defined, rounded carina extends backwards to the postero-ventral margin, dividing a broad, flattened, sloping posterior area from the rest of the valve. Lunular margin concave ; anterior margin well rounded and merging gradually into the gently convex ventral margin; postero-dorsal margin very slightly convex, almost straight, meeting the posterior margin in a very obtuse angle; posterior margin gently convex, meeting the ventral margin in a rounded angle. Lunule moderately large, elongate, depressed, bounded by a raised ridge. Escutcheon long, very narrow, steeply descending, sharply limited dorsally. Hinge stout; the two cardinals relatively short, diverging, the posterior one obliquely placed, both strong and elevated; cartilage pit moderately large, deep, very oblique. Margins of valve coarsely crenulate within. Surface ornamented with strong concentric ribs and furrows, ribs and furrows of about the same width; behind the carina the ribs become somewhat laminar and fine concentric ribs appear between them; the ornamentation is somewhat irregular.

Remarks.—This fine species is very different from *C. africanus* Woods (**77**, p. 303, pl. xxxv, fig. 21; pl. xxxvi, figs. 1–3) from the same deposits, both in form and disposition of the teeth and cartilage pit, and is not likely to be confused with it.

It more nearly resembles *C. macrodonta* (Sow.) (**55**, p. 417, pl. xxxviii, fig. 8), originally figured from Gosau by J. Sowerby, and since well figured and described by Zittel (**80**, p. 150, pl. viii, figs. 2, 3), but the umbones of the Gosau species are more massive, higher, and with greater anterior curvature, the escutcheon is wider, the teeth are longer and more laterally compressed, and the lunule is usually more sunken. The same remarks apply to the Ariyalur forms described by Stoliczka (**62**, p. 295, pl. v, figs. 12–14) and referred to the Gosau species.

FAMILY SPORTELLIDAE.

Genus ANISODONTA, Deshayes.

Anisodonta ?? *umzambiensis*, sp. nov.

(Pl. XXI, fig. 11.)

Material.—A right valve, in excellent preservation, but not showing the hinge, T. Mus., No. 1654.

Description.—Shell elongate, inflated. Umbonal region swollen, placed in front of the middle; umbo small, incurved, near the hinge margin. A strong carina extends obliquely backwards from the umbo to the postero-ventral angle, separating a wide, flattened, or slightly concave dorsal area. Postero-dorsal margin long, straight; posterior margin shorter, straight, meeting the postero-dorsal margin in a sharp angle of about 125° and the ventral margin in an angle of a little less than 90°. Ventral margin long, very gently convex ; anterior short, its margin well rounded and merging gradually into that of the ventral side. Surface with concentric striae and occasional stronger growth lines, which bend sharply at the carina, become more pronounced on the dorsal area, and meet the postero-dorsal margin somewhat obliquely.

Remarks.—The single specimen described above seems to be unique among Cretaceous Lamellibranchia, and its position cannot be definitely ascertained without a view of the hinge. It is referred *very* doubtfully to *Anisodonta* Deshayes, whose type comes from the Eocene of the Paris Basin, but the Pondoland shell is considerably longer and more markedly carinated. In shape it approaches some members of the genus *Unio*, but the prismatic layer is well developed.

Family VENERIDAE.

Genus Dosiniopsis, Conrad.

Dosiniopsis geversi, sp. nov.

(Pl. XXI, figs. 14–16.)

Material.—The holotype is a well-preserved left valve exhibiting the hinge and interior, S.A. Mus., No. 8518. Several imperfectly preserved specimens probably belong to the same species, S.A. Mus., Nos. 8370, 8374, 8565, 8567, 8617, 8678.

Description.—Shell moderately thick, rounded, oval, moderately convex ; longer than high, inequilateral. Antero-dorsal margin concave or nearly straight ; anterior margin rounded, passing gradually into the curved ventral margin ; postero-dorsal margin long, convex ; posterior margin rounded. Umbones small, pointed, anteriorly curved. Lunule elongated, flattened, bounded by an impressed line. Escutcheon narrow. Pallial sinus moderately large, rounded. Surface ornamented with fine concentric striae and growth lines.

Hinge of the left valve with three cardinals ; the median and anterior diverging from beneath the umbo ; the median robust ; the posterior oblique, slender, joined to the flattened nymph ; the anterior lateral elongate, parallel to the lunular margin ; the posterior lateral hardly evident.

Length, 30 mm. ; height, 26 mm.

Remarks.—This species appears to be extremely close to *D. sub-*

rotunda (Sowerby) (**76**, vol. ii, p. 181, pl. xxviii, figs. 1–6) from the Upper Greensand of Blackdown; the points of difference are the more nearly circular outline of the Blackdown form and the slightly less curved and more centrally placed umbones; the Pondoland form seems to be a thicker shell and is distinctly more inflated; the hinge and pallial sinus of the left valves agree in almost every detail.

Genus CYPRIMERIA, Conrad.

Cyprimeria ? *natalensis*, sp. nov.

(Pl. XXI, figs. 19–21.)

Material.—One specimen with the valves closed, well preserved, in the collection of the Durban Museum.

Description.—Shell small, oval, longer than high, only moderately convex. Umbones relatively prominent, anteriorly curved, touching, placed in front of the middle. Margins rounded, the anterior and posterior margins convex. No escutcheon. Lunule moderately large, elongately cordate, raised in the middle, limited by an impressed line. Surface polished, with traces of concentric sculpture.

Remarks.—This beautiful little shell is quite different from hitherto described Pondoland and Zululand Venerids, and has the form of *Cyprimeria*. The generic position is uncertain in the absence of hinge characters.

Sub-genus CYCLORISMA, Dall.

Cyprimeria ? (*Cyclorisma* ?) cf. *analoga* (Forbes).

(Pl. XXI, figs. 17, 18.)

Remarks.—A single specimen (T. Mus., No. 1579) appears from its shape and proportions, and poor development of the lunule, to belong to *Cyclorisma* Dall; it consists of the two valves, with finely preserved exterior, but shows nothing of the interior. The shell is rounded, oval, almost orbicular, moderately convex; length rather greater than height; moderately inequilateral. The antero-dorsal margin is short, slightly convex, passing gradually into the well-rounded ventral margin; postero-dorsal margin long, almost straight, but very slightly convex; posterior margin somewhat truncate. The umbones are small, close together, anteriorly curved, and beneath them is a small, depressed area corresponding to the lunule. The surface is ornamented with fine concentric lines, some stronger than others.

Length, 32 mm. ; height, 29 mm.

The species may be compared with *C. analoga* (Forbes) (**62**, p. 178, pl. v, figs. 21–23) from the Trichinopoli Group, with which it agrees fairly closely ; the Indian form is, however, relatively longer. The writer has recently described a very similar form from the Senonian of Angola (**51**).

Genus TRIGONOCALLISTA, nov.

This genus is proposed for two striking shells from the Senonian of Pondoland, *Meretrix umzambiensis* Woods (**77**, p. 304, pl. xxxvi, figs. 4–6), which may be taken as the type, and a new species, *T. spathi.* The genus differs from *Macrocallista* chiefly in the combination of a markedly trigonal shape and large escutcheon with the presence of an entire right posterior cardinal.

The group may be thus defined : shell stout, triangular, more or less truncate posteriorly, umbonal region very prominent, umbones with strong anterior curvature, very inequilateral. Lunule large, deep, cordate, well limited. Escutcheon large, wide, depressed, with a strong bounding ridge. Hinge very strong, teeth in the left valve consisting of three cardinals, the posterior joined to the nymph but well developed and elongate, the two others diverging from beneath the umbo ; the anterior lateral remarkably long and stout, the posterior lateral long and thin. In the right valve there are two cardinals below the umbo, a long, thick, superficially grooved posterior cardinal and long pits to receive the left laterals. Ornamentation concentric. Pallial sinus rounded, horizontal, not large.

Trigonocallista is remarkably stout and trigonal, and easily recognised by its very strongly curved umbones and well-marked escutcheon. The hinge is similar to that of Jukes-Browne's *Callistina* (**29**, p. 156), of which *M. plana* (Sowerby) (**76**, vol. ii, p. 192, pl. xxx, figs. 1–6) is the type, but differs from it in two important points, (1) the left anterior lateral is much longer and stouter and (2) the right posterior cardinal is not bifid but merely grooved along its summit. *Cytherea polymorpha* Zittel (**80**, pt. i, p. 126, pl. iii, fig. 6), which was associated with *M. plana* by Jukes-Browne, is rather more triangular than the type of *Callistina*, but otherwise agrees perfectly with it. *Cytherea renauxiana* d'Orbigny (**13**, vol. iii, p. 447, pl. ccclxxxvi, figs. 1–3) is very similar in shape to the two Pondoland species and possesses a similar escutcheon, but the hinge has not been figured.

Trigonocallista spathi, sp. nov.

(Pl. XXII, figs. 1–9.)

Material.—Founded on several well-preserved specimens in the collection of the Durban Museum. Also Transvaal Museum, No. 1580; South African Museum, No. 8707.

Description.—Shell stout, triangular, very inequilateral. Umbonal region very prominent, umbones with strong anterior curvature. Lunular margin deeply concave; anterior margin well rounded, passing gradually into the strongly curved ventral margin; postero-dorsal margin very long, slightly convex, almost straight; posterior margin truncate, meeting the postero-dorsal and ventral margins in obtuse angles. Lunule large, cordate, much depressed, bounded by a strong groove, outside of which is a raised ridge. Escutcheon large, wide, depressed, somewhat flattened, bounded by a strong ridge. Hinge of left valve strong; posterior cardinal strong, elevated, joined to the nymph, the median and anterior cardinals diverging from beneath the umbo, the anterior lateral stout, straight, and very long. In the right valve the median and anterior cardinals diverge from beneath the umbo; posterior cardinal large, slightly curved, elevated, narrowing upwards and with a slight groove; large deep pits for the left laterals. Pallial sinus moderately deep, rounded at the apex. Ornamentation consisting of regular concentric ridges and grooves, the ridges being elevated and sharp, and giving place to growth lines on escutcheon and lunule.

	(*a*).	(*b*).	(*c*).	No. 1580.
Length .	56 mm.	43 mm.	62 mm.	60 mm.
Height . .	48 ,,	37 ,,	54 ,,	53 ,,

Remarks.—This fine species is very close to *M. umzambiensis* Woods in the structure of the hinge, but is easily distinguished by the greater posterior truncation in the larger examples and the rather different, coarser ornamentation.

Genus MACROCALLISTA, Meek.

Sub-genus CALLISTINA, Jukes-Browne.

Macrocallista (*Callistina*) *euglypha* (Woods).

(Pl. XXII, figs. 10–12.)

1906. *Meretrix euglypha*, Woods: Ann. S. Afr. Mus., vol. iv, p. 305, pl. xxxvi, figs. 7–10.

Material.—Woods did not see the hinge of this species. The collection made by Gevers includes numerous specimens, two of which, S.A. Mus., Nos. 8588 and 8589, have the hinge quite undamaged.

Description (partly after Woods).—Shell oval, of moderate or small convexity. Margin near the lunule concave. Anterior margin well rounded and forming a continuous curve with the ventral margin. Posterior margin rounded, but often slightly truncate. Postero-dorsal margin with a gentle curvature. Umbones of moderate size, curving slightly. Lunule small, elongate, bounded by a groove.

Ornamentation consists of numerous strong, sharp, regularly concentric ribs, separated by deep and narrow grooves. The ribs are usually continued on to the lunule.

Hinge in the right valve with three cardinals ; the anterior and median small, laterally compressed, plate-like, diverging from beneath the umbo ; posterior cardinal oblique, long, divided, the posterior part longer than the anterior part. In front of the cardinals in the right valve there is a small elongate pit. Left valve with stout anterior and median cardinals diverging from beneath the umbo, the anterior nearly vertical ; posterior cardinal long, slender, oblique, situated on the flank of the nymph ; anterior lateral elongate, ridge-like.

Remarks.—The hinge of this species, which was described by Woods as a *Meretrix*, agrees exactly with that of Sowerby's *Venus planus* (**76**, vol. ii, p. 192, pl. xxx, figs. 1–6), which was made the type of *Callistina* by Jukes-Browne (**29**, p. 156).

Woods has discussed the relations between *M. euglypha* and *Cytherea hörnesi* Zittel from Gosau, *Cytherea fabulina* Stoliczka from Southern India, and other species.

The writer has had the opportunity of comparing perfect specimens of *M. euglypha* and *Meretrix andersoni* Bullen Newton. The latter is from the south side of the Manuan Creek Valley, and is described below among the Zululand forms as *Macrocallista* (*Callistina*) *andersoni.* The two species possess almost identical hinges, and are without doubt very closely allied. The Zululand species is, however, distinctly more inflated and is usually longer than *M. euglypha*, which possesses a much smaller lunule.

Family TELLINIDAE.

Genus Palaeomoera, Stoliczka.

Palaeomoera umzambiensis, sp. nov.

(Pl. XXIII, figs. 1–3.)

Material.—A single left valve, very well preserved, T. Mus., No. 1639.

Description.—Shell elongate-oval, compressed, inequilateral, length about 1½ times the height. Anterior part longer than the posterior, umbo small with a very slight anterior curvature. Ventral margin slightly convex, meeting the posterior margin in a very obtuse angle ; posterior and anterior margins rounded. A very obscure, rounded carina appears to extend from the umbo to the postero-ventral angle, where the margin is slightly raised. Hinge with a single anterior tooth, long and obliquely placed.

Ornamentation, on the posterior part, of numerous rounded radiating ribs separated by grooves which are wider than the ribs ; on passing the obscure carina the ribs come closer together, and towards the middle of the shell the intervening grooves pass into spaced, radiating striae ; the latter cease abruptly beneath the umbo, but ribs and grooves reappear antero-dorsally. The whole shell is covered with growth striae of varying strength, which give to the ribs a somewhat rugose appearance.

Remarks.—The form of the shell and the single oblique anterior tooth place this species in Stoliczka's *Palaeomoera.* It is very similar to *Palaeomoera inaequalis* (Sow.) (**76**, vol. ii, p. 173, pl. xxvii, figs. 2–8) from the Upper Greensand, but in the latter the radial ornamentation is confined to the posterior portion of the shell. *T. strigata* Goldfuss (**24**, vol. ii, p. 234, pl. cxlvii, fig. 18), the type of *Palaeomoera,* has fine radial ornamentation over the entire surface, while the Indian species *P. inconspicua* (Sow.) (**62**, p. 129, pl. iv, figs. 6–8) is entirely without radial ornamentation.

Palaeomoera sp.

(Pl. XXIII, figs. 4, 5.)

Material.—One right valve, T. Mus., No. 1638.

Description.—Like the preceding in form, but differing in the details of the ornamentation. On the posterior part are numerous strong ribs and grooves of equal width ; by flattening and broadening of the ribs this area soon passes into an area ornamented with spaced, sharp, radiating grooves, which become more widely spaced anteriorly. The whole shell is covered with sharp, regular, concentric lines.

Remarks.—The hinge was not clearly seen, but appears to be that of a *Palaeomoera*. The shell resembles the preceding rather closely and only further collecting will show whether it is a different species.

Palaeomoera haughtoni, sp. nov.

(Pl. XXIII, figs. 6–8.)

Material.—One right and two left valves, not showing the hinges; holotype a left valve, T. Mus., No. 1637; paratypes, T. Mus., Nos. 1649, 1650. The writer has also seen a specimen with the valves connected, in the collection of the Durban Museum.

Description.—Shell oval, elongate, considerably longer than high, moderately compressed, inequilateral. Umbo small, moderately prominent, behind the middle. Anterior long, the margin well rounded and merging quite gradually into the convex ventral margin. Posterior shorter, truncate; a rounded carina extending from the umbones to the postero-ventral angle of about 120°; posterior margin short, straight, and nearly vertical, meeting the short, slightly convex postero-dorsal margin in a rounded angle. Surface almost smooth, with faint growth striae, and at fairly regular intervals stronger growth rings, and with numerous faint, spaced, discontinuous radial lines.

Remarks.—This species is quite distinct from the preceding and from any species from Southern India, and from its form would appear to be a true *Palaeomoera*.

Genus MACOMA, Leach.

Macoma papyracea, sp. nov.

(Pl. XXIII, figs. 11, 12.)

Material.—One specimen with the valves closed, very well preserved, T. Mus., No. 1636.

Description.—Shell oval; longer than high, moderately inflated, very thin. Umbones small, fairly prominent, pointed, touching, behind the middle and posteriorly directed. Anterior longer than the posterior, broad, rounded, the margin passing quite gradually into the convex ventral margin. Posterior shorter, narrowed, compressed, slightly truncate at the tip, flexured. Surface with very numerous growth lines, the strength varying.

Remarks.—This interesting shell is probably a *Macoma*, but may possibly be a true *Tellina*. In form it approaches *M. lata* (Gmelin), regarded by Dall as identical with the genotype, and *M. praetenuis* (Leathes MSS.) (Wood), both Red Crag species (**75**, pp. 228–231, pl. xxi, figs. 6, 7), sufficiently well to justify the inclusion of the species in *Macoma*. As the crucial point is the absence of lateral teeth in *Macoma* and their presence in *Tellina*, the point cannot be decided without more complete material. The only Cretaceous form that appears to be comparable is the shell described by Whiteaves as *Cuspidaria suciensis* (**69**, p. 376, pl. xlvi, fig. 2), a smaller shell with a relatively narrower and more produced posterior.

Family SOLENIDAE.

Genus Solecurtus, Blainville.

Sub-genus azor, Gray.

Solecurtus (*Azor*) *woodsi*, sp. nov.

(Pl. XXIII, figs. 18–20.)

1906. *Solecurtus*? (*Azor* ?) *sp.*, Woods : Ann S. Afr. Mus., vol. iv, p. 308, pl. xxxvii, fig. 7.

Material.—The writer has seen numerous specimens—Transvaal Museum, Nos. 1582–1585 ; South African Museum, Nos. 8580, 8582. Also some examples in the collection of the Durban Museum. The diagnosis has been made from several specimens ; holotype Tvl. Mus., No. 1584, a large right valve which, however, does not exhibit the hinge ; Tvl. Mus., No. 1585 is the interior view of a left valve ; while S.A. Mus., No. 8580 is a left valve showing the hinge.

Description.—Shell elongate, inequilateral, slightly curved and moderately convex, with a distinct carina extending from the umbo to the angular postero-ventral extremity. Umbo small, placed a short distance in front of the middle. Dorsal margin gently convex ; ventral margin concave ; anterior margin rounded ; posterior truncate, the posterior and ventral margins meeting at an angle of about 80°. Lunule small, not distinct. In the holotype a ridge extends posteriorly from the umbo near the dorsal margin, becoming obsolete some distance before reaching the posterior margin.

Anterior adductor scar smaller than the posterior, oval, irregular in outline ; posterior scar larger, rounded. Pallial sinus deep, the end broadly rounded. Hinge of the left valve with a single oblique tooth beneath the umbo.

Surface ornamented with strong, irregular growth lines, meeting the dorsal margin anterior to the umbones at an acute angle ; these bend sharply upwards on crossing the carina and increase in strength, meeting the postero-dorsal margin obliquely.

Remarks.—Woods recorded two specimens, both very imperfect, as *Solecurtus* ? (*Azor* ?). The species is very similar to d'Orbigny's *Solen guerangeri* (**13**, vol. iii, p. 321, pl. cccli, figs. 1, 2), but is less elongated and posteriorly produced, and the umbo is more nearly central, while the postero-dorsal angle is more rounded. Stoliczka's *Tagellus albertinus* (**62**, p. 102, pl. iv, fig. 3) has a considerable superficial resemblance to *S. woodsi*, but that author states that there are two small teeth in the left valve, whereas *S. woodsi* possesses only one.

FAMILY MACTRIDAE.

Genus CYMBOPHORA, Gabb.

Cymbophora rogersi, sp. nov.

(Pl. XXIII, figs. 15–17.)

Material.—The holotype is a well-preserved left valve, T. Mus., No. 1651. There are two specimens in the collection of the South African Museum, Nos. 8372 and 8459, both incomplete.

Description.—Shell above the average in size, triangular, longer than high, inequilateral, moderately inflated. Umbo small, high, pointed, anteriorly curved, almost central. Antero-dorsal and postero-dorsal margins diverging from the summit at about 117°, the former long and straight, the latter gently convex. Ventral margin forming a broad curve, posterior straight and truncate, anterior very short and truncate. Lunule and escutcheon very narrow and indistinct. A weak, rounded carina extends obliquely backwards from the umbo to the postero-ventral angle and immediately in front of it is a shallow, rounded sulcus which widens gradually in the ventral direction and results in a concavity or sinuosity in the ventral margin in front of the angle. A faint sulcus can be made out extending obliquely forwards from the umbo to the very short, truncate, slightly concave anterior margin.

Ornamentation of numerous strong, concentric lamellae, which become progressively stronger ventrally ; these lamellae are weakened on the posterior carina.

Hinge strong, thick, with a large, deep, oblique, spoon-shaped chondrophore with sharply raised bounding ridges on either side ; cardinal tooth relatively small, like an inverted V in shape, and distinct from the raised anterior margin of the chondrophore. Anterior lateral tooth very strong and elevated ; the posterior very strong, longer but less elevated than the anterior ; laterals not cross-ribbed.

Adductor impressions large, subequal, sunken. Pallial sinus short, rounded.

Measurements of the holotype : length, 46 mm. ; height, 38 mm. ; thickness, 14 mm.

Remarks.—The genus *Cymbophora* was proposed by Gabb (**23**, p. 180) for *Mactra ashburneri* Gabb from the Cretaceous of California, distinguished by possessing a spoon-shaped chondrophore with raised margins, a slender cardinal distinctly separated from the chondrophore margin in the left valve, and large lateral teeth. According to Dall (**11**, p. 879), who studied the typical species, the attached ends of the resilium are convex and the margins of the pit therefore elevated ; and the ligament is fixed on the convex margin of the pit or on the side of the ventral lamina, or partly on both. The absence of a special septum separating the ligament and the resilium caused Dall to place the group as a sub-genus of *Spisula*, though Meek (**37**, p. 204) evidently considered that the raised posterior margin of the chondrophore is homologous with the septum of *Mactra*, for he placed *Cymbophora* under *Mactra*. Anderson (**1**, p. 74) has referred Gabb's species to *Mactra* without reference to *Cymbophora*. On the other hand, Wade (**67**, p. 95) has recently retained *Cymbophora* as a genus.

In the opinion of the writer the absence of a special septum separating the ligament and resilium is a point of resemblance between *Cymbophora* and *Spisula*. At the same time the ligament and resilium are very definitely separated by the raised posterior margin of the chondrophore, which leaves an elongated slit behind it for the reception of the ligament. The nature of the chondrophore and its relation to the ligament-slit and the cardinal tooth, as well as the unusually large laterals, warrant the retention of the genus. Dall has already remarked (*loc. cit.*) that the *Cymbophora* type of hinge occurs in most Mesozoic species of Mactridae.

C. gabbiana (Anderson) (**1**, p. 74, pl. vii, fig. 156), from the Lower Chico of California, resembles the Pondoland species closely in form and is strongly grooved concentrically, but appears to be without a posterior sulcus.

C. alta (Meek) (**37**, p. 210, pl. xxxvii, fig. 2) is relatively higher and more pointed, and with finer concentric sculpture. *C. gracilis* (Meek), figured by Wade (**67**, p. 95, pl. xxxi, fig. 8), is not unlike the Pondoland species; it is considered by Wade to bear a striking resemblance to *Mactra* (?) *zulu* Etheridge (**17**, p. 82, pl. ii, figs. 17–19) from Umkwelane Hill, but the latter is certainly not identical with *C. rogersi*.

Genus Mactra, Linnaeus.

Mactra ? *kaffraria*, sp. nov.

(Pl. XXIII, figs. 9, 10.)

Material.—A well-preserved left valve, T. Mus., No. 1652.

Description.—Shell triangular, compressed, longer than high, inequilateral. Umbo small, umbonal region prominent. Ventral margin gently convex; postero- and antero-dorsal margins diverging at about 100°; both straight, and meeting the ventral margin in rounded angles. From the umbo sharp carinae run to the anterior and posterior angles, cutting off on their dorsal sides narrow, steep, almost vertical areas, the anterior being wider than the posterior. Surface almost smooth, with very faint growth and radial lines.

Remarks.—This is a very distinct little shell, referred tentatively to *Mactra* on account of its form.

Family PHOLADIDAE.

Genus Martesia, Leach.

Martesia ? *sp.*

(Pl. XXIII, figs. 13, 14.)

Material.—An incomplete cast with the valves closed, T. Mus., No. 1592.

Description.—Shell moderate in size, elongate-ovate. A strong furrow descends obliquely backwards from the umbones to the ventral margin, dividing each valve sharply into an inflated anterior and a compressed, tapering posterior. Anterior well inflated, rounded, the antero-ventral margin rounded and oblique, anteriorly sub-truncate; ornamentation of strong, regular, oblique ribs separated by wider interspaces and traces of radial ribs. Umbones moderately inflated, not laterally compressed, longer than the anterior, tapering when viewed from the side, the ventral margin straight and horizontal, the dorsal oblique ; ornamentation like that on the anterior part. Accessory plates not seen ; anterior with small or no gape.

Remarks.—This interesting shell is not sufficiently well preserved for the generic position to be definitely ascertained, but it has the form of a *Martesia*. *Pholas cithara* Morton (**70**, p. 187, pl. xxv, figs. 14–16), regarded by Gabb as a *Martesia*, is readily distinguished by having the posterior more quickly tapering and laterally compressed, a less deep dividing furrow, more strongly developed radial ornamentation, more prominent umbones and higher anterior region. *M. cuneata* Meek (**37**, p. 259, pl. xxx, fig. 8) is very much smaller and with the concentric ribs well developed, but is less oblique in the anterior region.

Pholas reticulata Müller (**28**, p. 140, pl. viii, figs. 1, 2) regarded by Stoliczka (**62**, p. 23) as probably a *Martesia*, from the Senonian of Aachen, resembles the present species closely in shape, but the radials are more strongly developed, and the present species is more oblique anteriorly.

GASTROPODA

Family PATELLIDAE.

Genus Patella, Linnaeus.

Patella kaffraria, sp. nov.

(Pl. XXIV, figs. 1–4.)

Material.—Two specimens; holotype, S.A. Mus., No. 8477, paratype, S.A. Mus., No. 8572.

Description.—Shell moderately convex, with the apex obtusely pointed, not incurved, and placed well in front of the middle ; the sides are straight, or only very slightly convex. Aperture oval, considerably longer than wide, with wavy margin. Surface with stout, rather irregular, radial ribs, and narrow furrows ; on the posterior side the ribs are of two sizes, the larger and smaller alternating ; on the anterior side there are more numerous, finer ribs ; the ribs are crossed by irregular growth markings.

Remarks.—It need hardly be stated that the genus *Patella* is here used in the widest possible sense. The species is apparently distinct from any previously described from the Cretaceous.

FAMILY EUOMPHALIDAE.

Genus SEMISOLARIUM, Cossmann.

Semisolarium bailyi (Gabb).

1855. *Solarium pulchellum*, Baily: Q.J.G.S., vol. xi, p. 457, pl. xii, fig. 3 (*non* d'Orbigny, 1850; Prodr. de Pal., ii, p. 104).
1871. ,, *wiebeli*, Griesbach: Q.J.G.S., vol. xxvii, p. 65, pl. iii, fig. 6.
1861. ,, (*Architectonica*) *bailyi*, Gabb: Proc. Amer. Phil. Soc., vol. viii, p. 95.
1906. ,, *bailyi*, Woods: Ann. S. Afr. Mus., vol. iv, p. 315, pl. xxxviii, figs. 4, 5.
1915. *Semisolarium bailyi*, Cossmann: Paléoconch. Comp., vol. x, p. 156.

Remarks.—Cossmann has included this species and *Architectonica kossmati* R. B. Newton (**43**, p. 23, pl. viii, figs. 11, 12) in his genus *Semisolarium* in the family Euomphalidae. *Solarium* sp. ind., R. Etheridge, jr., from Umkwelane Hill, Zululand (**17**, p. 88, pl. ii, figs. 35–37), may be identical with *S. bailyi*, but the specimens seen by the writer from that locality are too poor for comparison.

FAMILY TROCHIDAE.

Genus CHILODONTA, Etallon.

Sub-genus AGATHODONTA, Cossmann.

Chilodonta (*Agathodonta*) *africana*, sp. nov.

(Pl. XXIV, figs. 8–10.)

Material.—One specimen, S.A. Mus., No. 8630, consisting of two whorls, the aperture and ornamentation fairly well preserved.

Description.—Shell small, trochiform, a little elongated, with a spiral angle of about 45°. Whorls very convex, the height of the whorls less than half their width; sutures deep, subcanaliculate. Aperture almost circular, entire, comparatively large; outer lip moderately thick; inner lip somewhat thickened; columella provided with a large, median, amorphous tooth, in front of which is a stout, conical tubercle. The plane of the aperture is inclined to the sutures at an angle of about 50°. Surface ornamented with numerous stout spiral ribs, separated by grooves which are a little narrower than the ribs; in places the ribs appear to be somewhat nodular, the nodules being arranged in transverse lines, and the penultimate whorl bears several obscure transverse folds.

Remarks.—The sub-genus *Agathodonta* was created by Cossmann to include three Cretaceous species which differ from *Chilodonta* in several respects. In *Agathodonta* the shell is more elongated; the transverse striae are not continuous from suture to suture, but are present only on the spiral ribs, where they form tubercles; the aperture has only a few tubercles, and the columella is provided with two teeth instead of one. The type of *Agathodonta* is *Trochus dentiger* d'Orbigny (**12**, p. 185, pl. clxxvii, figs. 9–12), figured also by Cossmann (**6**, vol. xi, p. 200, pl. vii, figs. 8–11), from the Neocomian of France. *C. africana* differs in no essential features from *C. dentigera*; the tubercles on the riblets are less in evidence in the Pondoland species, and the obscure transverse folds seem to be peculiar to the species. The whorls of *C. guyotiana* (Pictet et Roux) and *C. tollotiana* (Pictet et Roux) (**48**, vol. ii, pp. 202, 203, pl. xix, figs. 8, 9) are much less convex.

Genus Margarites (Leach MSS.) Gray.

Sub-genus solariella, Wood.

Margarites (*Solariella*) *radiatula* (Forbes).

(Pl. XXIV, fig. 11.)

1846. *Trochus radiatulus*, Forbes: Trans. Geol. Soc. Lond., ser. 2, vol. vii, p. 120, pl. xiii, fig. 11.
1868. *Solariella radiatula*, Stoliczka: Cret. Gastr. S. India, p. 375, pl. xxiv, figs. 17–19; pl. xxviii, figs. 8, 9.
1906. *Margarita radiatula*, Woods: Ann. S. Afr. Mus., vol. iv, p. 310, pl. xxxvii, fig. 13.
1918. *Eumargarita* (*Solariella*) *radiatula*, Cossmann: Paléoconch. Comp., vol. xi, p. 260.

Remarks.—The examples from Pondoland seen by Woods did not exhibit the fine spiral striae characteristic of young specimens from the Ariyalur Group. The present collection contains numerous specimens, most of which, though apparently perfectly preserved, are quite smooth or covered only with faint growth lines; two, however, S.A. Mus., Nos. 8575, 8631, show spiral striae, which are stronger on the posterior half of the last whorl than on the base of the shell; in front of the sutures the spiral striae are crossed by fine transverse ribbings.

The generic name *Margarites* (Leach MSS.) Gray, 1847, must be retained for this group, according to the rules of nomenclature. *Margarita* Leach, 1819, must be discarded as the name was first used by that author in 1814 for a Lamellibranch; *Eumargarita* Fischer, 1885, which was retained by Cossmann in 1918, must give place to *Margarites* owing to priority. The name *Margarites* has been used subsequently by Mojsisovics in 1889 for an Ammonite.

FAMILY NERITIDAE.

Genus NERITA, Linnaeus.

Nerita umzambiensis, Woods.

(Pl. XXIV, figs. 6, 7.)

1906. *Nerita umzambiensis*, Woods: Ann. S. Afr. Mus., vol. iv, p. 311, pl. xxxvii, figs. 14, 15.

Remarks.—The species was founded by Woods on three specimens. The Transvaal Museum collection contains one specimen which is considerably larger than either of the examples figured by Woods. In form and ornamentation it agrees exactly with the types, so that there is nothing to add to the original description of the species. T. Mus., No. 301.

Length, 35 mm.; breadth, 43 mm.

Nerita kaffraria, Woods.

(Pl. XXIV, fig. 5.)

1906. *Nerita kaffraria*, Woods: Ann. S. Afr. Mus., vol. iv, p. 311, pl. xxxvii, fig. 16.

Remarks.—The species was founded by Woods on a single specimen, in which traces of the original colour-banding still exist. In the collection of the Transvaal Museum there is a single specimen referable to this species in which the colour bands are preserved with remarkable clearness. The coloration consists of alternate, broad, sharply limited, spiral bands of dark brown and dirty white; the two brown bands are situated respectively on the anterior side near the margin of the aperture and immediately behind the part of greatest convexity. T. Mus., No. 1604.

FAMILY PYRAMIDELLIDAE.

Genus TRAJANELLA, Popovici-Hatzeg.

Trajanella dutoiti, sp. nov.

(Pl. XXIV, figs. 16–18.)

1855. *Turritella Renauxiana*, Baily: Q.J.G.S., vol. xi, p. 458.
1867. *Eurchrysalis gigantea*, Stoliczka: Cret. Gastr. S. India, p. 290 (reference only).
1870. ,, ,, Griesbach: Q.J.G.S., vol. xxvii, p. 65.
1906. *Pseudomelania* (*Oonia*) *sp.*, Woods: Ann. S. Afr. Mus., vol. iv, p. 313, pl. xxxviii, fig. 1.
1909. *Trajanella sp.*, Cossmann: Paléoconch. Comp., vol. viii, p. 109.

Material.—Holotype and paratype in the Durban Museum Collection.

Description.—Shell large, thick, elongately oval. Spire relatively short, composed of at least five whorls; spiral angle about 50°; whorls of the spire flat or very slightly convex; sutures not conspicuous. Aperture relatively small, lunate, narrowing considerably in the posterior direction, rounded anteriorly; aperture somewhat oblique and anteriorly truncated, so that the interior is seen when the shell is viewed from the front. Outer lip thin; inner lip with a thin deposit of callus. Surface smooth, with moderately sinuous growth striae.

Remarks.—The collection of Pondoland fossils made by Captain Garden and described by Baily in 1855 included an imperfect specimen, which Baily erroneously referred to *Turritella Renauxiana* d'Orbigny. The specimen was seen by Stoliczka in the Museum of the Geological Society of London and identified with the Trichinopoli-Ariyalur species, in which he was followed by Griesbach. The specimen was not, however, figured until 1906, when Woods referred it to the group *Oonia* Gemmellaro. Cossmann regarded it as a new species of *Trajanella*. The Pondoland species should be referred to *Trajanella* on account of its peculiar eulimoid shape and truncated aperture; *Oonia*, which according to Cossmann does not occur above the Barremian, is more conical in outline, and the whorls of the spire are more distinct, while the aperture is straight.

T. dutoiti is very closely related to the Indian species, *T. gigantea* (Stoliczka) (**61**, p. 289, pl. xxi, figs. 3–5), but differs in that the spire is less elongated, the aperture relatively smaller (if the restoration given by Stoliczka is correct) and the sutures less distinct. In the Indian species the inner lip appears to be provided with a thicker deposit of callus.

Sturm has figured a similar form from the Chlomek Beds in Saxony (**63**, p. 67, pl. v, fig. 1), but Cossmann questions its identification with the Indian species.

Family FOSSARIDAE.

Genus Lysis, Gabb.

Lysis capensis, sp. nov.

(Pl. XXIV, figs. 19–21.)

Material.—Holotype, T. Mus., No. 1615; paratype, T. Mus., No. 1614. There is also a cast in the collection of the South African Museum, collected by Dr. Gevers, No. 8534.

Generic Diagnosis (after Gabb, Pal. Calif., vol. i, p. 138).—"General form like *Stomatia*. Shell sub-spiral, very oblique; spire moderately prominent; whorls costate. Aperture narrow, oblique; outer lip simple; columellar lip straight and rather heavily incrusted. Umbilicus broad, but entirely closed by a concave expansion of the incrusting layer of the inner lip."

Description.—Shell moderately thin, semi-ovate, oblique, below the average in size. Spire small, pointed, obliquely placed. Whorls three, rapidly increasing in size, sutures impressed. Last whorl large, forming most of the shell, rounded posteriorly, flattened anteriorly, with six stout, sharp, spiral ribs, widely spaced on the posterior and closer together on the anterior, with broad, flattened interspaces; third rib from the posterior more elevated than the others, marking the angulation of the whorl; interspaces crossed by numerous oblique, irregular, growth lines, which are extended across the ribs and in places tend to give them a serrate or roughened appearance. Aperture oblique. Outer lip not seen. Inner lip smooth, entire, very slightly concave; umbilical region represented by a broad, concave, smooth area of callus, sharply carinated along its outer edge.

Remarks.—Gabb founded the genus *Lysis* for a new and interesting little species from the Upper Cretaceous of California, *L. duplicosta*

Gabb, but gave no indication of what he considered to be its affinities, other than stating that the general form was like *Stomatia*, which is almost entirely a recent group. Stoliczka (**61**, p. 158) remarks that it " . . . has the general form of *Fossar*, and partly that of *Natica* and *Stomatia*," and " it is, properly speaking, very much allied to *N. carinata* Sow. sp., which is very probably a *Fossar*." Fischer placed it in the Naticidae (**19**, p. 768), while in Zittel (**81**, p. 558) it is included under Thaisidae. The writer has here placed it in the Fossaridae on account of its form and ornamentation, and considers it to be closely allied to *Phasianema* S. Wood (**6**, vol. x, p. 88), from which it differs principally in the complete closing of the umbilicus; in other respects the two groups seem to be very similar, and it may well be that *Lysis* should be regarded merely as a sub-genus of *Fossarus*. The only other figured Cretaceous species which appears to be at all like *Lysis* is the *Natica ? carinata* Sowerby (**56**, p. 343, pl. xviii, fig. 8) quoted by Stoliczka, a form which is at once distinguished by its open umbilicus and stouter shell, but in general resembles the Fossaridae rather closely.

It is of extraordinary interest to be able to record a species of this genus in the South African Senonian deposits. *L. capensis* resembles the genotype sufficiently closely in general features (few whorls, obliquity, ribbing, nature of the umbilicus) as to leave no doubt as to the relations of the two species. It is distinguished from the Californian species by its rather more inflated and less oblique body-whorl, the angulation which persists in each of the specimens examined, and a slightly larger spire.

FAMILY NATICIDAE.

Genus GYRODES, Conrad.

Gyrodes tenellus, Stoliczka.

(Pl. XXV, figs. 1–7.)

1868. *Gyrodes tenellus*, Stoliczka: Cret. Gastr. S. India, p. 306, pl. xxii, fig. 14.
?1904. ,, *sp.*, R. Etheridge, jr.: Second Rep. Geol. Surv. Natal and Zululand, p. 88, pl. ii, fig. 32; pl. iii, fig. 1.
1906. ,, *sp.*, Woods: Ann. S. Afr. Mus., vol. iv, p. 317, pl. xxxviii, figs. 9, 10.

Remarks.—The collection made by Gevers includes numerous, mostly small, well-preserved examples of *Gyrodes.* Though these show a certain amount of variation in form, the writer believes them to belong to one and the same species, and can find no point of difference between them and *G. tenellus*, described by Stoliczka from the Trichinopoli and Ariyalur Groups. The variation lies in the width of the whorls and height of the spire—a common feature of Naticoid shells, and in the depth of the depression of the posterior part of each whorl.

Woods has figured two low-spired examples from Pondoland, which resemble the figures given by Stoliczka very closely, as Woods has observed. Some of the Pondoland shells at first sight appear to be rather different by reason of their wider whorls and consequently more elevated spires, but are connected with the low-spired forms through intermediary varieties. The forms from Umkwelane Hill figured by Etheridge most probably are but high-spired examples of *G. tenellus*, though they are too poor to make the identification absolutely certain.

In all varieties the aperture is large, the outer lip thin and the inner lip without a deposit of callus. The umbilicus is very large and deep, and is bordered by a moderately sharp spiral ridge, on the outside of which is a second, more rounded ridge. The surface is covered with numerous fine, oblique, growth lines ; in one or two examples an exceedingly fine spiral striation is discernible. The posterior portion of each whorl is in some specimens only flattened, in others the posterior shelf is concave, and the edge of the whorl rises to the suture ; there does not appear to be any relation between the nature of this part of the shell and the height of the spire.

The high-spired varieties approach *G. pansus* Stoliczka (**61**, p. 305, pl. xxii, figs. 9–13) in form, but the crenulations characteristic of this species do not occur in any of the Pondoland examples, and the species attains to greater dimensions.

G. manuanensis R. B. Newton (**43**, p. 18, pl. viii, figs. 9, 10) from Zululand, probably Senonian, is much larger and shows traces of marginal crenulations.

Family TURRITELLIDAE.

Genus Turritella, Lamarck.

Sub-genus haustator, Montfort.

Turritella (*Haustator*) *meadi*, Baily.

(Pl. XXIV, figs. 12–15.)

1855. *Turritella meadii*, Baily: Q.J.G.S., vol. xi, p. 458, pl. xii, fig. 6.

Material.—The collection contains numerous worn specimens and casts of small Turritellids, which may be assigned to *T. meadi*; S.A. Mus., Nos. 8400, 8501, 8573 are fairly well preserved.

Description.—Shell small, turritelliform, of about 12 whorls, with a spiral angle varying from 15° to 20°. Whorls flattened or very gently convex towards the sutures; sutures well marked, varying in depth; the anterior side of each whorl sometimes obscurely carinated, with a very narrow area in front of it descending steeply to the suture. Surface ornamented with numerous spiral riblets, every second or third being slightly stronger than the others; and covered with faint, sinuous growth markings, which are a little posterior to the middle of each whorl, deeply concave towards the aperture.

Remarks.—The specimens seen by Baily are mostly casts, and the figure given by him is a restoration based on a fragment. The specimens in the present collection show great variation in the proportions of the whorls; the spiral angle, which in Baily's figure is about 18°, varies from 15° to 20°, and the forms with the larger angle tend to have deeper sutures than those with small angles. The ornamentation, though variable and somewhat irregular in each individual, is of the same type throughout.

The species is close to *T. imbricataria* Lamarck, the type of *Haustator* Montfort (**6**, vol. ix, p. 114, pl. viii, figs. 10, 11). The three Senonian species of *Haustator* from Southern India, *T. dispassa* Stoliczka, *T. pondicherriensis* Forbes, and *T. gemina* Stol. (**61**, pp. 217, 218, pl. xvi, xix), are larger forms with different ornamentation and not likely to be confused with *T. meadi*.

Genus ARCOTIA, Stoliczka.

Arcotia vanhoepeni, sp. nov.

(Pl. XXV, figs. 8–10.)

Material.—The holotype is a very well preserved specimen in the collection of the Durban Museum; also S.A. Mus., No. 8393.

Description.—Shell small, elongately conical. Spire elongated, composed of 5 moderately convex whorls, which are carinated in front of the middle, the posterior part of the whorls somewhat flattened and tapering posteriorly. Sutures well marked. Last whorl large, well rounded, carinated, moderately flattened at the base. Aperture of the holotype damaged on the exterior side, outer lip missing; aperture more or less rounded, subangular on the anterior side; plane of the aperture parallel to the axis of the shell; outer lip probably thin; inner lip smooth. Umbilicus open, narrow, tube-like. Protoconch smooth, dextral, paucigyrous.

Ornamentation of relatively stout spiral ribs and transverse riblets. In front of the middle the carina is accentuated by a strong, rounded, spiral rib. Posterior to the carinal rib, on the flattened part of the whorls, are five weaker spiral ribs separated by concave interspaces wider than themselves. Anterior to the carinal rib on each whorl of the spire is a single spiral rib, in front of which is a steep descent to the suture. On the rounded part of the last whorl there are three moderately prominent spiral ribs separated by wide interspaces, in each of which lies a very weak spiral rib. On the base there are about seven moderately strong ribs, between each pair of which is a weak rib. The spiral ribs and their interspaces are crossed by transverse growth lines of considerable strength—they may almost be termed riblets—which run almost straight from suture to suture, but are very slightly concave towards the aperture. The intersection of spiral ribs and transverse riblets results in a series of knots or tubercles along the former.

Remarks.—Stoliczka founded *Arcotia* (**61**, p. 212) for a single species from the Trichinopoli Group, *A. indica* Stol. (*ibid.*, p. 215, pl. xvi, fig. 12; pl. xix, fig. 6), the genus being thus defined: *Arc. testa turrita, elongata, crassiuscula; anfractibus spiraliter striatis; striis incrementi rectis, non sinuatis; columella excavata; apertura angulate-rotundata, antice subeffusa.* The open umbilicus and straight growth lines separated the genus from *Turritella.* Cossmann (**6**, vol. ix, p. 126) has regarded *Arcotia* as a synonym of *Mesalia* Gray, and stated that Stoliczka's figures show that *A. indica* has the same form, ornamentation, and aperture as the type of that genus. With this view the writer cannot agree; the description and figures given by Stoliczka indicate perfectly clearly the open umbilicus and straight growth lines which characterise *Arcotia*; on the other hand, *Mesalia* invariably has the umbilicus closed and the growth lines and outer lip possess the sinuous character seen in the majority of *Turritellids*. *Arcotia* is therefore retained as a genus, and its close relation to *Turritella* and to *Mesalia* is regarded as questionable.

A. vanhoepeni differs from the genotype in several respects, and is not likely to be confused with it; the latter is a larger form with the whorls more definitely flattened above the carinal rib, and has fewer spiral ribs, while the transverse lines are weaker and do not cut the summits of the spiral ribs into tubercles. *Turritella* (*Zaria*) *ventricosa* Forbes (**61**, p. 227, pl. xvii, fig. 15; pl. xix, figs. 22, 23), which was doubtfully referred to *Mesalia* by Cossmann, is certainly not an *Arcotia*, and was probably rightly placed in *Zaria* by Stoliczka.

Arcotia margaritata Frech (**22**, p. 180, pl. xvi, fig. 13) from the L. Senonian of Central Europe has weaker spiral ribs and smaller spiral angle.

Family SCALIDAE.

Genus Confusiscala, de Boury.

Confusiscala ornata (Baily).

1855. *Scalaria ornata*, Baily: Q.J.G.S., vol. xi, p. 459, pl. xii, fig. 2.
1906. *Scala ornata*, Woods: Ann. S. Afr. Mus., vol. iv, pt. 7, p. 314, pl. xxxviii, figs. 2, 3.

Remarks.—Cossmann (**6**, vol. ix, p. 75) places this species in the genus *Confusiscala* de Boury, of which the type is *S. dupiniana* d'Orbigny, and to which *S. decorata* (Römer) also belongs. The species was compared with these European forms by Woods, but the aperture has not yet been figured.

Family CHENOPIDAE.

Genus Dicroloma, Gabb.

Sub-genus perissoptera, Tate.

Dicroloma (*Perissoptera*) *bailyi* (R. Etheridge, jr.).

(Pl. XXV, figs. 11–15.)

1904. *Alaria? bailyi*, Etheridge : Sec. Rep. Geol. Surv. Natal and Zululand, p. 83, pl. iii, figs. 4–8.
1906. *Dicroloma* (*Perissoptera*) *sp.*, Woods : Ann. S. Afr. Mus., vol. iv, p. 319, pl. xxxviii, fig. 14.

Material.—Two specimens, both incomplete, one with the wing perfectly preserved, T. Mus., Nos. 1612, 1613. A perfect specimen in the collection of the Durban Museum, but with the surface somewhat worn. Diagnosis partly after Woods and Etheridge.

Description.—Shell elongate. Spire formed of 8 slightly convex, non-carinate whorls ; apical angle 36° ; ornamented with strong, oblique, slightly curved, transverse ribs, about 14 per whorl, separated by broad, rounded interspaces ; ribs and interspaces crossed by numerous minute spiral ribs, which are coarser and more widely separated just in front of the sutures than elsewhere, and are interrupted by faint growth lines. Last whorl rounded, ornamented with minute spiral ribs and faint growth lines ; the transverse ribs are represented by a few swellings on the part of greatest convexity, giving the appearance of an indistinct ridge posterior to the middle of the whorl. Anterior canal not seen. Outer lip thin, expanded into a large wing which is truncated a little obliquely and is more or less quadrangular in outline and without digitations, gently convex on its outer edge, concave above and below, rather sinuous towards the suture ; wing ornamented with irregular growth lines and minute spiral ribs ; wing reaching to about the middle of the penultimate whorl.

Remarks.—The writer does not hesitate to identify the Pondoland shells with the species figured by Etheridge from Umkwelane Hill. On comparison with the present specimens, however, it would seem that the strength of the spiral ribs towards the posterior side of each whorl has been slightly exaggerated in Etheridge's figures. The shape of the wing and its attitude (the angle between wing and spire is rather greater than 90°), together with the relatively small apical angle and relatively few transverse ribs, separate this shell from other Senonian species. *D. schlotheimi* (Römer) from Aachen (**28**, vol. vi, pl. vii, fig. 13) seems to be very close to it, but has more numerous transverse ribs, and the wing is expanded to a certain extent posteriorly. *D. papilionacea* (Goldfuss) (**24**, vol. iii, p. 18, pl. clxx, fig. 8) is a very different species; judging from the figure given by Goldfuss, a larger shell with more numerous transverse ribs which are continued over the body whorl; subsequent authors, however, have assigned to *D. papilionacea* forms in which the transverse ribs are more or less obsolete on the body whorl, as in our species, and less numerous on the spire; the forms described by Stoliczka from Southern India (**61**, p. 31, pl. ii, figs. 9, 10) do not appear to be identical with the type of Goldfuss, and have the body whorl free from transverse ribs, but the examples figured are considerably larger than *D. bailyi.*

Dicroloma (*Perissoptera*) *sp.*

(Pl. XXV, figs. 16–18.)

Remarks.—One specimen in the collection, S.A. Mus., No. 8699, differs from *D. bailyi* in that the strong transverse folds are not developed. The surface is covered with strong transverse lines and riblets of varying strength, and with faint spiral lines which are strongest just in front of each suture. It may be but a variety of *D. bailyi.*

Dicroloma (*Perissoptera*) *sp.*

(Pl. XXV, figs. 19, 20.)

Remarks.—S.A. Mus., No. 8494 is a small *Perissoptera* with strong transverse ribs as in *D. bailyi.* It differs from that species, however, in that the entire shell is covered with fairly strong spiral ribs, which are stronger and less numerous than the corresponding spiral lines of *D. bailyi.*

Family STROMBIDAE.

Genus Pugnellus, Conrad.

Pugnellus contortus (Forbes).

(Pl. XXV, figs. 24–26.)

1846. *Strombus contortus* (G. B. Sowerby MSS.), Forbes: Trans. Geol. Soc. Lond., vol. vii, p. 129, pl. xv, fig. 9.

1871. *Pugnellus contortus*, Stoliczka : Cret. Gastr. S. India, p. 19, pl. iii, figs. 1–5.

Material.—A single specimen with the anterior missing but with the outer lip intact, T. Mus., No. 1611.

Description.—Shell very thick and solid, elongate in the direction of the axis, rounded, consisting of about 6 whorls, with a spiral angle of about 60°. Spire much shorter than the last whorl, of 5 whorls, almost entirely covered by callus, the sutures just visible dorsally. Last whorl rounded ; with about 7 stout transverse ribs in the dorsal half, placed obliquely, very slightly curved, thickened into tubercles along the region of greatest convexity, thus giving to the whorls a slight angularity ; these ribs die away anterior to the tubercles ; surface otherwise smooth. Aperture long, moderately wide. Outer lip thick, expanded into a large wing, with a very stout lobe which has a pointed, projecting process on the posterior end and a sharp ventral crest ; on the inside of the lobe is a flattened area with a stout median ridge extending from an anterior to a posterior notch. Inner lip much thickened with callus, which extends over all the ventral part of the last whorl and over most of the spire right up to the apex.

Remarks.—This fine species is according to Stoliczka very characteristic of the Trichinopoli Group. The Pondoland specimen agrees very closely with the figures of a well-preserved specimen given by that author (figs. 1, 1*a–d*). *P. uncatus* (Forbes) (**61**, p. 22, pl. iii, figs. 9–13) is readily distinguished by the more delicate and more numerous curved ribs and more tapering anterior.

P. crassicostatus Noetling from the Maestrichtian of Baluchistan (**46**, p. 61, pl. xvi, figs. 3, 4) is founded on casts and appears to be closely allied to *P. uncatus*. This species has been figured by Boule and Thevenin from Madagascar (**3**, p. 46, pl. 1, fig. 3), but the identification is based on imperfect material.

P. auriculatus Woods (**77**, p. 319, pl. xxxviii, fig. 15) from Pondoland has more angular whorls and different ornamentation.

FAMILY CYPRAEIDAE.

Genus CYPRAEA, Lamarck.

Cypraea chubbi, sp. nov.

(Pl. XXVI, figs. 1–6 ; pl. XXVII, figs. 1–4.)

Material.—The holotype is a very large example in the collection of the Durban Museum. Apparently belonging to the same species are two smaller examples in the same collection, and a very small shell, T. Mus., No. 1624.

Description.—Shell large, robust, ovoid, longer than high, narrower in front than behind, with flattened base. Highly involute, the spire visible but small. Base smooth, periphery of the base coarsely crenulate ; dorsal surface covered with numerous low tubercles, which are arranged in oblique rows. Aperture moderately wide, elongate, gently curved, narrow behind, widening gradually in front. Posterior notch deep, rounded in posterior view, with thick, slightly extended lips which form a very short canal. Anterior notch narrow, twisted in the direction of the termination of the apex, probably without extended lips. Columella smooth, without folds, and bearing a slight depression. Outer lip straighter than the inner, with a crenulated margin (about 18 "teeth"), thick ; inner lip less well defined, inflated, obscurely crenulated at the anterior end.

Remarks.—The two remaining specimens in the Durban Museum Collection are smaller, and although they resemble the holotype in shape and in the nature of the aperture, they differ in certain ways which are probably due to the fact that they have not reached the adult state. The specimens are somewhat worn, but nevertheless it would seem that the dorsal surfaces possessed traces of the tubercles that characterise the adult. In one specimen the base is only slightly flattened, and without the coarsely crenulated periphery which in the adult greatly accentuates the flattening of the base ; at the same time the posterior notch is without the incipient canal seen in the adult. In the other specimen the periphery of the base is partially produced and very slightly crenulate, and the posterior notch is a little sub-canaliculate ; the specimen is slightly smaller than the other, but appears to be intermediate in character between it and the holotype.

T. Mus., No. 1624, is very much smaller than the above specimens, but is of exactly the same proportions, is quite smooth, and with simple anterior and posterior notches. The spire is barely visible. The aperture is like that of the larger examples. It is very probably a young form of the above.

It is very interesting to find specimens of this genus, so rare in Cretaceous rocks, among the Pondoland forms. *C. chubbi* is unique among Cretaceous members of the genus in size and ornamentation. The two smaller Durban Museum specimens are very like the forms for which Jousseaume created the section *Bernayia* (**6**, vol. v, p. 156); they agree with *Bernayia* in proportions, smoothness of shell, and in the structure of the columella and aperture. Like *Bernayia* the posterior notch is provided with slightly projecting lips, and the columella is smooth, without folds, and with a slight depression. The ornamentation, crenulate periphery, and sub-canaliculate posterior notch of the holotype at once differentiates the species from *Bernayia*, to which, however, it is probably allied.

The smallest specimen resembles some of the forms described by Forbes and Stoliczka from Southern India. *C. cunliffi* Forbes (**61**, p. 450, pl. xxviii, fig. 29) has a smaller posterior notch and the surface is finely reticulated. *C.* (*Epona*) *globulina* Stol. (**61**, p. 451, pl. xxviii, fig. 30), like the preceding from the Ariyalur Group, is more inflated and apparently possesses small projecting lips both anteriorly and posteriorly. The only European form at all like it seems to be the Danian *C. bullaria* (von Schlotheim) (**50**, p. 22, pl. ii, figs. 4, 5), but the latter is relatively shorter and with a more curved aperture.

Family DOLIIDAE.

Genus Pirula, Lamarck.

Sub-genus PROTOPIRULA, nov.

This sub-genus is proposed for the Pondoland species described below, *P. capensis* sp. nov., characterised by the absence of the typical ornamentation of *Pirula* s.s. and by the poor development of the anterior canal.

According to Fischer (**19**, p. 662) and Cossmann (**6**, vol. v, p. 140) the genus is characterised by having a thin, piriform shell, with the surface reticulated or nodular, the aperture large and elongated, the canal long and arched, the lip smooth and thin, the columella smooth and sinuous. The genus appears in the earliest Tertiary, and increases until the present day, forming a small but natural group, all the members of which are characterised by the marked reticulated surface and long canal, though some forms are more or less nodular or sub-carinated. *Protopirula* is proposed for some well-preserved specimens, which differ from the genotype in that they possess no ornamentation other than faint growth lines and in not possessing a produced anterior canal. It may be regarded as ancestral to *Pirula* s.s., just as the Upper Senonian *Protodolium* Wilckens, *P. speighti* (Trechmann), of New Zealand (**74**, p. 18, pl. iv, figs. 3–5), is ancestral to *Dolium*, and differs from the latter in the absence of the canal. Both the genera of Doliidae are thus seen to have Upper Cretaceous forerunners in which the canal is absent or poorly developed.

Pirula (*Protopirula*) *capensis*, sp. nov.

(Pl. XXV, figs. 21–23.)

Material.—Two well-preserved shells. Holotype, T. Mus., No. 1626; paratype, T. Mus., No. 1625. Also three imperfect specimens in the collection of the Durban Museum.

Description.—Shell moderate in size, highly involute, thin. Spire very small, consisting of about two whorls, pointed. Last whorl forming most of the shell, oval, elongated and convex, tapering very gradually towards the anterior. Aperture large, outer lip thin, smooth, and convex; inner lip smooth; anterior not produced into a canal but somewhat truncate. Ornamentation solely of faint growth striations, gently convex towards the aperture.

Family BUCCINIDAE.

Genus Tritonidea, Swainson.

Sub-genus CANTHARULUS, Meek.

Tritonidea (*Cantharulus*) *kaffraria*, sp. nov.

(Pl. XXV, figs. 27, 28.)

Material.—The holotype is an almost perfect specimen in the collection of the Durban Museum.

Description.—Shell ovate, fusiform. Spire composed of 5 turreted, carinated whorls; spire less than the body-whorl in height; the carina on each whorl is situated a little in front of the middle and divides the whorl into a flattened, sloping, posterior part and a narrower, flattened, anterior part. Sutures well marked. Body-whorl large, inflated, rounded, only obscurely carinated. Aperture large, ovate; outer lip thin; columella twisted, with a swelling below; inner lip large, smooth, with a moderately thick callus.

Surface coarsely and somewhat irregularly ornamented. Whorls of the spire with about 15 transverse ribs with furrows between of about the same width; these ribs are obliquely placed, swell into tubercles along the carina and weaken towards the posterior suture; they are crossed by 6 or 7 narrow, widely separated spiral ribs. On the body-whorl the transverse ribs are somewhat irregular and nodular where crossed by the spiral ribs; finer spiral riblets are intercalated between the principal spiral ribs. On all the whorls there are numerous fine, rather sinuous, transverse riblets, or prominent growth lines.

Remarks.—Meek formed the section *Cantharulus* for the Missouri species *Fusus vaughani* Meek (**37**, p. 379, pl. 32, fig. 5, text-fig. 48; **6**, vol. iv, p. 173, pl. vii, fig. 1), which was placed under *Tritonidea* by Cossmann. *T. kaffraria* differs from the type mainly in having a wider aperture, but agrees with it in the structure of the columella, in general shape and in the nature of the ornamentation. Cossmann refers to the section, but with some doubt, *T. pondicherriensis* (Forbes) (**61**, p. 127, pl. xi, figs. 10–12) from the Trichinopoli Group, and *T. gosauicum* (Zekeli) (**79**, p. 82, pl. xv, fig. 1). The latter is much smaller than the Pondoland form, has fewer transverse ribs, and is not carinated. The Indian species resembles *T. kaffraria* rather closely, and has the same ovate aperture, but the whorls of the spire are not carinated, and the species differs in the details of the ornamentation.

FAMILY CHRYSODOMIDAE.

Genus SIPHONALIA, Adams.

Siphonalia ? umzambiensis, sp. nov.

(Pl. XXVII, fig. 5.)

Material.—Holotype S.A. Mus., No. 8416; paratype, S.A. Mus., No. 8509.

Description.—Shell fusiform. Spire turreted, composed of 4 convex non-carinated whorls, less than the body-whorl in height; spiral angle about 55°. Last whorl large, rounded. Aperture ovate. Outer lip not seen; inner lip smooth and without columellar folds.

Ornamentation of strong transverse folds separated by rounded furrows of about the same width, folds and furrows crossing the whorls from suture to suture; about 12 folds to the volution. These are crossed by numerous narrow, spiral ribs, which are separated by interspaces wider than themselves; on the posterior part of the last whorl additional weaker spiral ribs appear, one between each pair of principal spiral ribs. There are in addition fine growth and spiral lines forming a network.

Remarks.—This species appears to have the form and ornament of *Siphonaria*, but the absence of the anterior canal in both specimens introduces some uncertainty.

The Trichinopoli shells figured by Stoliczka (**61**, p. 124, pl. xi, figs. 8, 9) as *Tritonidea requieniana* (d'Orbigny) may be identical with this species, or are at any rate closely allied. Stoliczka thought that the Indian forms belonged to d'Orbigny's *Fusus requieniana* (**12**, p. 342, pl. ccxxv, fig. 3), with which *F. buchi* Müller (**40**, p. 35, pl. v, fig. 15) was identified. Holzapfel has since studied *F. buchi* and placed it in *Chrysodomus* (**28**, p. 102, pl. x, figs 9–12), a genus which is, however, without strong axial ornament; at the same time the identity of the species with that of d'Orbigny was denied.

S. umzambiensis has the axial folds more strongly developed than *S. buchi*, and the radial ribs are fewer and more prominent. D'Orbigny's species is much larger, and appears to be characterised by relatively few and hence widely separated transverse folds, and the anterior canal is straight.

FAMILY FUSIDAE.

Genus LATHYRUS, Montfort, em. Cossmann.

Sub-genus MAZZALINA, Conrad.

Lathyrus (*Mazzalina*) *geversi*, sp. nov.

(Pl. XXVII, figs. 6–8.)

Material.—One well-preserved specimen, S.A. Mus., No. 8486.

Description.—Shell small, ovate. Spire rather short, of about 4 moderately convex whorls; spiral angle about 70°; sutures well marked. Last whorl much larger than the spire, rounded, attenuate anteriorly. Aperture elongately oval, produced into a short, slightly bent, anterior canal. Inner lip curved, smooth; columella provided towards the anterior with three relatively stout, slightly oblique folds, of which the anterior is placed a little distance away from the other two, which are close together.

Surface ornamented with low, rounded, spiral riblets, and shallow furrows of about the same width as the riblets. The riblets are most numerous towards the anterior of the last whorl and are obsolete on the part of greatest convexity ; a few riblets are rather prominent just behind the part of greatest convexity, both on the last whorl and on the whorls of the spire ; there is one rather deeply impressed furrow close to the suture on the posterior side of each whorl. The shell is covered with transverse growth striae ; the penultimate whorl bears obscure, transverse folds, which are also traceable on part of the last whorl on the part of greatest convexity.

Remarks.—The character shown by this shell is quite in agreement with the description of *Mazzalina* given by Cossmann, and with his figure of the species *L. staminea* (Tate) (**6**, vol. iv, p. 51, pl. ii, fig. 17). The only Cretaceous species indicated by this author is *Fasciolaria buccinoides* Meek (**37**, p. 358, pl. xxxi, fig. 8), from the Fox Hills Group of Missouri, a larger and more evenly ornamented species ; it is very like *L. geversi* in shape, and sometimes shows similar weak transverse folds on the convex part of the whorls.

The single specimen from the Ariyalur Group, described by Stoliczka as *Neptunea rhomboidalis* (Zekeli) (**61**, p. 120, pl. x, fig. 21), appears to be rather like the Pondoland shell, but the anterior canal is more twisted ; columellar folds are not indicated in the figure, but if they are present, then the shell is certainly not identical with the Gosau forms described by Zekeli (**79**, p. 80, pl. xiv, fig. 9), and referred to *Sycum* (*Palaeatractus*) by Cossmann (**6**, vol. iv, p. 83). It is possible that Stoliczka's *Volutomitra canaliculata* from the Trichinopoli Group (**61**, p. 100, pl. ix, figs. 12, 13) belongs to *Mazzalina*, but the species was founded on imperfect material.

Genus CRYPTORHYTIS, Meek.

Cryptorhytis rigida (Baily).

(Pl. XXVII, figs. 9–12.)

1855. *Voluta rigida.*	Baily : Q.J.G.S., vol. xi, p. 459, pl. xii, fig. 14.
Non. 1868. *Fasciolaria rigida.*	Stoliczka : Cret. Gastr. S. India, p. 109, pl. x, figs. 10–16.

Non. 1906. *Cryptorhytis rigida.* Woods: Ann. S. Afr. Mus., vol. iv, p. 321, pl. xxxix, fig. 2, pl. xl, fig. 1.

Material.—Three specimens in the collection of the Durban Museum have been seen by the writer. Two of these are large, well preserved, but incomplete anteriorly; the third is about half grown, and is beautifully preserved.

Description.—Shell fusiform, scalariform. Spire shorter than the last whorl, consisting of five convex whorls with deep sutures. Posterior part of whorls with a concave depression or sulcus, having a tumid margin or ridge near the suture. Spiral angle, 55°–60°.

Ornamentation consists of numerous, broad, rounded, transverse folds, which are usually indistinct on the posterior sulcus, but reappear on the tumid posterior margins of the whorls, and are continued anteriorly over the greater part of the last whorl. The transverse folds are from 14–19 per volution, and are separated by deep, concave grooves of about the same width as themselves. Numerous moderately strong spiral ribs are present, and are separated by interspaces wider than themselves; the spiral ribs become stronger on the anterior part of the last whorl. Growth lines are present.

Aperture oval-elongate, angular behind. Outer lip not clearly seen. Inner lip thin, concave. Columella without folds. Anterior canal moderately long, slightly bent.

Length (of young example), 14·5 mm.; breadth, 8 mm.

Remarks.—Baily's type has been lost. The following is the original description:—

"*V. testa oblonga; spira conica; anfractibus superne angulatis, longitudinaliter costatis; costis in angulis turgidis, et prope suturam subobsoletis, spiraliter sulcatis; apertura angulata, elongata.*

"Length of broken specimen, $1\frac{5}{10}$ inch; probable entire length, $1\frac{8}{10}$ inch.

"Breadth, $\frac{17}{20}$ths of an inch.

"Shell somewhat cone-shaped, with about 18 longitudinal ribs, coarsely striated spirally. The summit of the whorls is formed at the suture into a rim with slight continuations of the longitudinal costae and striae of growth. The plications of the columella are not exposed."

The description is accompanied by a single figure showing the dorsal view of a nearly perfect specimen.

The specimens which were well described and figured by Woods as *C. rigida* belong to a different but closely allied species, to which the name *C. pseudorigida* sp. nov. is given below. The writer has had the opportunity of comparing three examples of *C. rigida* with two of *C. pseudorigida*, all being well preserved. The species differ chiefly in the number and disposition of the transverse ribs. In the former the transverse ribs are 14–18 in number, and they are continued anteriorly down the slope of the base of the body-whorl, becoming extinct before the canal is reached ; posteriorly the ribs are thickened very slightly just in front of the sulcus, where they disappear, but their positions are indicated behind the sulcus by fairly well-defined swellings on the tumid posterior edges of the whorls ; the grooves between the transverse ribs are concave and straight ; the spiral ribs are moderately strong and numerous. In *C. pseudorigida* the transverse ribs are 10–12 in number, and they are not continued much in front of the point of greatest convexity of the body-whorl ; posteriorly the ribs are broadest in front of the sulcus ; the transverse ribs are absent from the sulcus and from the tumid posterior edges of the whorls ; the grooves between the transverse ribs are shallow and ill-defined ; the spiral ribs are much stronger than in *C. rigida* and are not quite as numerous. The differences given above are clearly brought out in the figures given by the writer and those given by Woods, and there can be little doubt that Baily's figure belongs to the species here regarded as *C. rigida*.

Examples from the Trichinopoli Group (**61**, p. 109, pl. x, figs. 10–16) were identified by Stoliczka with the Pondoland species, but the Indian form is larger and more elongated, with a smaller spiral angle, and with three columellar folds, besides differing in the details of the ornamentation.

Baily compared his specimen with *Voluta cincta* Sowerby, which Stoliczka regarded as probably identical with *Hemifusus cinctus* Stol. (**61**, p. 114, pl. x, figs. 17, 18), which is rather similar to the present species but has a shorter spire, broader body-whorl, and more numerous transverse ribs. Cossmann (**6**, vol. iv, p. 72) has cited this species as probably belonging to Gabb's section *Perissolax*, but it is more like *Cryptorhytis* in proportions.

Cryptorhytis pseudorigida, sp. nov.

1906. *Cryptorhytis rigida.* Woods : Ann. S. Afr. Mus., vol. iv, p. 321, pl. xxxix, fig. 2, pl. xl, fig. 1.

Non. 1855. *Voluta rigida.* Baily : Q.J.G.S., vol. xi, p. 459, pl. xii, fig. 14.

Remarks.—The differences between this species and *C. rigida* have been given above. The writer selects as holotype the specimen from which were taken Woods' figs. 2*a*, 2*b*, and 2*c*, pl. xxxix (in the collection of the South African Museum). The specimens used by the writer in arriving at this determination are S.A. Mus., Nos. 8596, 8717.

Cryptorhytis, ? sp.

(Pl. XXVII, figs. 13, 14.)

Remarks.—The collection includes two examples, S.A. Mus., Nos. 8523, 8640, of a small fusiform shell which is probably a *Cryptorhytis*. As the aperture and anterior canal are missing in both specimens, the generic position cannot be definitely ascertained. Externally it resembles the *Cryptorhytis* sp. figured by Woods (**77**, p. 322, pl. xl, fig. 2) from the same deposits, but is much smaller and the spiral ribs anterior to the angulation of the last whorl are decidedly weaker and narrower. *C. pseudorigida* is more elongate and has more prominent transverse folds.

Genus PALEOPSEPHAEA, Wade.

Paleopsephaea scalaris, sp. nov.

(Pl. XXVII, figs. 23, 24.)

Material.—A single complete specimen, in places with the surface badly preserved, T. Mus., No. 1606.

Description.—Shell fusiform, much elongated. Spire of about 6 whorls, longer than the last whorl; whorls convex, sutures well marked. Last whorl large, gently convex, tapering anteriorly. Spiral angle 35°. Aperture elongated, narrow, angular above, produced anteriorly into a long, slightly curved canal. Outer lip thin, slightly convex; columella with folds, one oblique fold being visible. Whorls with stout transverse folds, about 10 per whorl, stretching from suture to suture, with elevated crests, accentuating the convexity of the whorls, the folds on successive whorls contiguous; folds separated by broad, rounded interspaces, almost smooth, but with very faint indications of growth and spiral striae.

Remarks.—This species appears to be closely allied to *P. mutabilis* Wade (**67**, p. 123, pl. xl, figs. 4, 5, 8) from the Upper Cretaceous of the Ripley Formation of Tennessee, which is the type of *Paleopsephaea* Wade, placed by that author in the Volutidae, here regarded as allied to *Cryptorhytis*. It differs from the type in having less swollen, sharper, transverse ridges and fainter spiral striation. The genus does not appear to be known from Southern India, and the European species placed in the genus by Wade, *Fusus subsemiplicatus* d'Orbigny, *Voluta roemeri* Geinitz and *Mitra nana* Müller (for references, see Holzapfel, **28**, pp. 95–100, and Wade, **67**, p. 123) are more remotely related to the type than is the Pondoland form.

Paleopsephaea kaffraria, sp. nov.

(Pl. XXVII, figs. 15, 16.)

Material.—Two specimens, including the holotype, in the collection of the Durban Museum ; also S.A. Mus., Nos. 8479, 8505, 8632.

Description.—Shell fusiform, elongated. Spire of about 6 whorls, longer than the last whorl ; whorls convex, sutures distinct. Spiral angle about 35°. Aperture elongated, narrow, angular above, produced anteriorly into a long canal. Outer lip thin ; inner lip slightly concave ; columella without folds. Whorls with stout, rounded, transverse folds, about 10 per whorl, stretching from suture to suture ; and with numerous strong, narrow, spiral ribs, which are separated by interspaces wider than themselves.

Remarks.—This species resembles the preceding in form, apical angle and absence of the posterior sulcus, but differs in being without columellar folds and in having strong spiral ribs. It is not unlike *P. pergracilis* Wade (**67**, p. 124, pl. xl, figs. 3, 7), but has more transverse folds and no columellar folds.

Family TURBINELLIDAE.

Genus Pyropsis, Conrad.

Pyropsis geversi, sp. nov.

(Pl. XXVII, figs. 17–19.)

Material.—The holotype was collected by Gevers, and is now in the collection of the South African Museum, No. 8551. There is also a specimen in the collection of the Transvaal Museum, No. 1616, and one in the Durban Museum collection.

Description.—Shell relatively small, thick, globose, consisting of about four whorls. Spire very short, whorls concave, sutures well marked. Last whorl very large, forming the bulk of the shell, with a carina posterior to the middle line ; anterior to the carina the whorl is convex, ornamented with three or four spiral ribs, which together with the carina bear stout tubercles at regular intervals where they are crossed by growth ridges; posterior to the carina the whorl is concave, rising towards the suture into a prominent tubercled ridge; surface with numerous growth lines and at regular intervals strong growth ridges. Aperture circular; outer lip thick, bevelled, smooth within: inner lip large, smooth. Anteriorly apparently expanded into a long canal, the base only preserved in the present specimens; last whorl constricted where it merges into the canal.

Remarks.—This fine species appears to be very distinct, the more noteworthy features being the strong tuberculation, the circular outline of the aperture, which is only slightly angular at the carina and at the anterior and posterior end, and the anterior constriction of the last whorl. It is thus very different from the large *P. africana*, described by Woods (**77**, p. 322, pl. xxxviii, fig. 17; pl. xxxix, fig. 1) from the same beds. The species recalls the smoother *Tudicla eximia* Stoliczka (**61**, p. 151, pl. xii, figs. 5–8) from the Ariyalur Group. It resembles to a certain extent *P. gracilis* Wilckens (**72**, p. 23, pl. iii, fig. 16), but this Patagonian form is more oblique and with a more prominent spire; the species has also been figured by Wilckens from Antarctica (**73**, p. 93, pl. iv, fig. 7).

Genus SEMIFUSUS, Swainson.

Subgenus MAYERIA, Bellardi.

Semifusus (*Mayeria*) *acuticarinatus*, sp. nov.

(Pl. XXVII, figs. 25, 26.)

1906. *Semifusus* ? (*Mayeria* ?) *sp.*, Woods: Ann. S. Afr. Mus., vol. iv, p. 324, pl. xl, fig. 5.

Material.—One specimen, almost complete, T. Mus., No. 1620.

Description.—Shell fusiform, elongated, consisting of 6 whorls. Spire about as long as the last whorl (excluding the extended anterior canal); whorls angular, with a remarkably high, laterally compressed, sharp carina, which is placed anteriorly to the middle of the whorls, dividing the whorls into a wide, concave area on the posterior side and a narrower concave area on the anterior side; a second much smaller carina is placed on the anterior side of the whorls close to the shallow but well-marked suture. Anterior much produced into a long, straight, anterior canal. Aperture elongated, angular above, narrow, outer lip smooth. Inner lip without callus or columella folds. Ornamentation of numerous small spiral ribs, varying in strength, separated by spaces wider than themselves; ribs crossed by faint growth striae which are concave towards the aperture.

Remarks.—The writer has compared this species with specimens of the Oligocene *S.* (*Mayeria*) *errans* (Soland.) (**6**, vol. iv, p. 94, pl. iv, fig. 13) and does not hesitate to place it in the same group, for it agrees very closely in proportions, shape of the whorls and aperture, and in the nature of the ornamentation. Its nearest ally seems to be the *Lagena secans* of Stoliczka (**61**, p. 138, pl. xi, figs. 19, 20), founded on imperfect material, but the Ariyalur species differs in that the second carina, which on the last whorl is rather strongly developed, does not appear on the whorls of the spire as it is embraced by succeeding whorls; this species is regarded by Cossmann as probably belonging to *Mayeria* (*loc. cit.*, p. 94).

Semifusus (*Mayeria*) *umzambiensis*, sp. nov.

(Pl. XXVIII, figs. 1, 2.)

Material.—A single complete specimen, T. Mus., No. 1617.

Description.—Shell fusiform, moderately elongated, consisting of about 6 whorls. Spire shorter than the last whorl; whorls angular, with a conspicuous carina, placed near the suture on the anterior side of the whorls, dividing the whorls into a broad, flattened, or slightly concave posterior area and a narrow, steep, anterior area. Carina on the last whorl with stout conical tubercles, about 11 to the half-volution; tubercles slightly elongated in the direction of the growth striae. Anterior tapering, produced into a long anterior canal. Aperture oval and angular above, narrowed and elongated anteriorly. Without callus or columellar folds. Ornamentation anterior to the tubercled carina of the last whorl of numerous, widely separated, sharp ribs; surface with well-marked sinuous growth striae, concave towards the aperture.

Remarks.—This species agrees closely with *S.* (*Mayeria*) *errans* (cited above) and must undoubtedly be placed in the same group. There do not seem to be any Cretaceous species with which it can be compared.

Semifusus (*Mayeria*) *kaffrarius*, sp. nov.

(Pl. XXVIII, figs. 3–6.)

1906. *Semifusus* ? (*Mayeria* ?) *sp.*, Woods: Ann. S. Afr. Mus., vol. iv, p. 325, pl. xl, fig. 6.

Material.—Holotype, T. Mus., No. 1618; paratype, T. Mus., No. 1619. There is also one specimen in the Durban Museum collection.

Description.—Shell fusiform, of about 5 whorls. Spire shorter than the last whorl, whorls angular and sharply carinate, the carina situated close to the anterior side, dividing the whorls into a flattened or slightly concave posterior area and a narrow, steep, anterior area. Carina on last whorl, with a few broad swellings or tubercles. Aperture sub-circular, outer lip thickened; inner lip smooth, with a deposit of callus; anterior expanded in a short, slightly twisted canal. Ornamented with small, spiral, widely separated ribs anterior to the carina of the last whorl, fine spiral lines, and growth striae; behind the carina on the last whorl there are only sinuous growth striae and fine spiral lines, the latter sometimes present near the carina only.

Remarks.—This species is closely allied to the last, with which it agrees very closely in the shape of the whorls and ornamentation. It is readily distinguished by its relatively shorter canal and by the shape of the aperture. In *S. umzambiensis* the outer lip is markedly angular and the aperture elongate, whereas in *S. kaffrarius* the carina disappears towards the aperture, so that there is no trace of angularity in the ventral view, the aperture being almost circular. This feature is seen even in immature forms (T. Mus., No. 1619).

Family ACTAEONIDAE.

Genus Actaeonella, d'Orbigny.

Sub-genus trochactaeon, Meek.

Actaeonella (*Trochactaeon*) *woodsi*, sp. nov.

(Pl. XXVIII, figs. 17–21.)

1906. *A.* (*Trochactaeon*) *sp.*, Woods: Ann. S. Afr. Mus., vol. iv, p. 328, pl. xli, fig. 1.

Material.—Three specimens, T. Mus., Nos. 1621–1623; holotype, T. Mus., No. 1621. Also five examples in the collection of the Durban Museum.

Description.—Shell elongately oval, stout. Spire of about 6 whorls, moderately convex, the shape obscured by a row of very large, stout tubercles; spiral angle of 70°–80°. Last whorl longer than the spire, cylindrical in form, tapering gradually towards the anterior; base tapering more rapidly, posterior part with a sloping ledge adjacent to the well-marked but shallow suture, the upper part of the whorl ornamented with 10–12 very stout tubercles. Surface smooth, except for faint growth lines on the last whorl, slightly convex towards the aperture. Columella short, with three strong folds, of which the posterior is much stronger than the other two, and the anterior is weakest. Outer lip thin.

Remarks.—This fine species is very closely allied to *A. beyrichi* Drescher (see references in Woods), but should be regarded as a distinct species. The European species has in general a shorter spire and a more rounded and less cylindrical shape, and fewer tubercles along the posterior side of the whorls; in these features, however, it is very variable. The figures given by Drescher also show that the three columellar folds are equally strong, whereas, in all the Pondoland specimens examined, the posterior fold is much more strongly developed than the other two. *A. beyrichi* is a Lower Senonian form.

A. cretacea (Müller) (**28**, p. 82, pl. vii, figs. 11, 14–16), from the Aachen Greensand, appears to be very similar but is too poor for exact comparison.

A. cylindracea (Stoliczka) (**61**, p. 419, pl. xiv, figs. 10–14), from the Utatur and Trichinopoli Groups, is without tubercles, and the whorls taper both anteriorly and posteriorly.

A. salomonis Fraas (**10**, p. 383, pl. xxxv; figs. 3–6) is devoid of tubercles and has a more tapering spire.

Two specimens in the Durban Museum collections are almost completely devoid of tubercles, but traces can be made out, their apparent absence being due at least in part to the state of preservation; the tubercles may not have been strongly developed.

Family BULLIDAE.

Genus Bullinella, Newton.

(=Cylichna, Loven.)

Bullinella sp.

(Pl. XXVII, figs. 20–22.)

Material.—One imperfect specimen, S.A. Mus., No. 8527.

Remarks.—Shell small, cylindrical; aperture rounded below and angular above; surface with spiral lines separated by broad, smooth interspaces. The specimen is too imperfect for exact comparisons, the anterior and posterior being considerably damaged. It is comparable with *B. inermis* (Stoliczka) (**61**, p. 431, pl. xxvii, fig. 20) from the Ariyalur Group, and *B. thomsoniana* (Wilckens) (**74**, p. 24, pl. v, figs. 6, 7) from the Upper Cretaceous of New Zealand. Two species of *Cylichna* have been described by Etheridge from Umkwelane Hill, *C. fusuliniformis* (**17**, p. 87, pl. ii, figs. 33, 34) and *C. griesbachi* (*ibid.*, p. 86, pl. iii, figs. 14, 15).

FAMILY RINGICULIDAE.

Genus RINGICULA, Deshayes.

Ringicula woodsi, sp. nov.

(Pl. XXVIII, figs. 7–11.)

Material.—The holotype, S.A. Mus., No. 8528, is well preserved, but the aperture is damaged and partly concealed, and the callus on the inner lip is only partly visible. A second example, S.A. Mus., No. 8493, is less well preserved and traces only of the ornamentation appear on the last whorl, but portions of the aperture are visible, showing callus, columellar folds and part of the outer lip. Also S.A. Mus., No. 4873 from the railway cutting, Umfolisi, Zululand, and No. 5114 from Umkwelane Hill.

Description.—Shell small, moderately elongate. Spire of 4 slightly convex whorls, sutures well marked, spiral angle about 55°. Last whorl larger than the spire, convex, rounded. Surface polished, provided with numerous, narrow, non-punctate grooves; grooves consisting of two fine impressed lines placed close together and sometimes rather wavy; grooves most numerous towards the anterior of the last whorl, where they are regularly spaced and separated by wide, flattened interspaces; towards the posterior of the last whorl and on the spire the grooves are more widely spaced and situate at irregular intervals. Aperture moderately large, more or less oval, outer lip thick. Inner lip provided with a thick deposit of callus; and towards the anterior end with one stout columellar fold, in front of which there appears to be an indication of a second, probably smaller, fold.

Remarks.—The two specimens here described agree in general features with the genotype, *R. ringens* (Lamarck) (**6**, vol. i, p. 113, pl. iii, figs. 12–14), and with the Aachen species figured by Holzapfel, *R. hagenowi* (Müller) (**28**, vol. xxxiv, p. 86, pl. vii, figs. 1–7). The species appears to be more nearly allied to *R. acuta* Forbes (**61**, p. 424, pl. xxvii, fig. 3), from the Trichinopoli Group, but the callus of the inner lip is thicker and the spiral ornamentation more strongly developed in *R. woodsi.*

FAMILY HELICIDAE.

Genus ANCHISTOMA, Klein.

Anchistoma umzambiense, sp. nov.

(Pl. XXVIII, figs. 12–16.)

Material.—One specimen, partly a cast, with the test adhering to the spire, and the aperture incomplete, T. Mus., No. 1628.

Description.—Shell planorboid. Spire flattened, of about 5 convex rounded whorls with strongly impressed sutures ; whorls of the spire ornamented with numerous very regular transverse riblets and grooves, which are convex towards the aperture. The whorls increase in width very gradually and regularly. Last whorl convex, with its greatest width above the middle. Umbilicus wide and deep, the bases of the whorls very convex. Aperture more or less oval, narrowed above and flattened below. Outer lip contracted or compressed at about the middle, but teeth or folds corresponding to the contraction are missing. Inner lip with only one horizontal fold, situated at about the middle ; the fold being elevated and plate-like, projecting to the centre of the aperture, concave to the upper suture, and descending a little towards the aperture. The flattened base of the outer lip bears a stout, upwardly projecting fold, almost triangular in section.

Remarks.—In view of the extreme rarity of the *Helicidae* in Cretaceous deposits, it is of great interest to be able to describe a species referable to the family among the Pondoland forms. Though the single specimen is far from being perfect and the presumably reflexed portions of the aperture are missing, sufficient data are obtainable to justify a new specific name. The generic position is uncertain and the name *Anchistoma* is here used in a wide sense.

The only species hitherto recorded from Cretaceous horizons in any way related to *A. umzambiense*, are the four species described by Stoliczka (**61**, pp. 6–12, pl. i) from the Upper Cretaceous of Southern India—where they occur, as does the present species, among marine forms. Three of these were referred to *Anchistoma* Klein and one to *Macrocyclis* Beck. The specimens were carefully re-examined by Nevill (**42**, p. 128) in connection with his investigations into the modern terrestrial Mollusca of the region, and the determinations made by Stoliczka of the first three species received his support, with the addition that he was of the opinion that they belonged to Helder's section, *Gonostoma*, and were not related to either *Corilla* Adams or *Plectopylis* Benson of the modern Indian fauna. The fourth species he considered to belong to *Patula* Helder. *A. umzambiense* does not appear to be very close to *A. cretaceum* Stoliczka, the only species in which the apertural armature was seen, for the latter is provided with more numerous and differently arranged folds, but the outer lip is similarly contracted or compressed near the middle.

4.—Appendix.

CRETACEOUS OF ZULULAND.

The Cretaceous fauna of Zululand was described by R. Etheridge, jr. (**17**, **18**), G. C. Crick (**8**), and R. Bullen Newton (**43**) in the years 1904–9, when it was shown that various Upper Cretaceous horizons were represented there. The similarity of the matrix of different horizons unfortunately led to the mixing of fossils from different beds, and the locality names were used in a very wide sense. At the same time a large proportion of the material is in a poor state of preservation —in striking contrast to the material from Pondoland—and thus many of the species erected by Etheridge and Newton are of very doubtful value and uncertain horizon. The area is at present being investigated in the field by Dr. E. C. N. van Hoepen, whose results are awaited with interest; a preliminary account of the Manuan Creek deposits has already been published (**66**).

The South African Museum has since acquired large collections of Zululand fossils made by A. L. du Toit, W. J. Wybergh, J. S. Hedges, and others, the Cephalopoda of which have been the subject of an important work by Spath (**58**). While the Ammonoidea have yielded results of great importance, the Lamellibranchia and Gastropoda are for the most part in such a poor state of preservation and fragmentary condition, that to attempt to describe them would merely add to an already overburdened literature. Some of the forms, however, merit description either because they are unusually good examples of known forms or as new species.

The following species are described below, all species which have previously been described from the area :—

Albian.	*Neithea quadricostata* (Sowerby).
	Veniella etheridgei R. B. Newton.
	Macrocallista (*Callistina*) *andersoni* (R. B. Newton).

Senonian. *Trigonoarca capensis* (Griesbach).
Cardium (*Acanthocardium*) *denticulatum* Baily.
Veniella forbesiana (Stoliczka).
Eriphyla lenticularis (Goldfuss).

In addition, the following new species are described (together with three forms belonging to the Brachiopod genus *Cyclothyris*—the phylum being new to the area) :—

Senonian. *Nucula zululandensis* sp. nov.
Macrocallista (*Callistina*) *zululandensis* sp. nov.
Cyprimeria ? sp.
Semifusus (*Mayeria*) *natalensis* sp. nov.

The Senonian. Spath has commented upon the dissimilarity between the Cephalopod fauna of Pondoland and that of the approximately equivalent horizons at Umkwelane Hill and the Umfolosi valley. Thus out of 29 species of Cephalopoda from Umkwelane Hill and neighbouring localities, only one ammonite (*Pseudoschloenbachia umbulazi*) is identical with a Pondoland species, together with some uncoiled and straight forms (*Bostrychoceras* ?, *Diplomoceras* ?, *Baculites*) and a *Nautilus* (**58**, p. 269). The difference becomes all the more striking when it is seen that the Upper Senonian of the Manuan Creek area, not far to the north, is more like that of Pondoland than Umkwelane Hill (*ibid.*, p. 302). The discrepancy between the Umkwelane Hill—Umfolosi and Pondoland faunas, however, is not so noticeable when the other elements of the fauna are taken into account, though many of the commoner Lamellibranchia and Gastropoda of the Pondoland deposits have not yet been found at Umkwelane Hill (e.g. *Trigonia shepstonei*, *T. elegans*, *Pecten* (*Chlamys*) *amapondensis*, *Crassatellites africanus*, *Trigonocallista umzambiensis*, *Cardium griesbachi*, *Pseudomelania sutherlandi*). The writer has been able to compare numerous forms from both areas ; the following Pondoland species are represented from Zululand * in the collection of the S.A. Museum, or have already been recorded by Etheridge and Newton :—

(*a*) Umkwelane Hill, Umfolosi valley.
Trigonoarca capensis (Griesbach).
Nordenskjöldia natalensis (Baily).
Inoceramus expansus Baily.
Neithea quinquecostata (Sowerby).

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* Spath has given a map showing the fossiliferous localities in the Umfolosi valley, Ann. S. Afr. Mus., vol. xii (1921), p. 222.

Pleuromya africana (R. Etheridge, jr.).
Liopistha (*Psilomya*) *corrugata* Woods.
Veniella forbesiana (Stoliczka).
Eriphyla lenticularis (Goldfuss).
Cardium (*Acanthocardium*) *denticulatum* Baily.
Protocardia hillana (Sowerby).
Gyrodes tenellus Stoliczka.
Turritella (*Zaria*) *bonei* Baily.
,, (*Haustator*) *meadi* Baily.
Confusiscala ornata (Baily).
Dicroloma (*Perissoptera*) *bailyi* (R. Etheridge, jr.).
Rostellites capensis Woods.
Ringicula woodsi sp. nov.

(*b*) Lake Itesa (or Eteza), Umfolosi valley.
Nordenskjöldia natalensis (Baily).
Glycimeris africana (Griesbach).
Veniella forbesiana (Stoliczka).
Cardium (*Acanthocardium*) *denticulatum* Baily.
Turritella (*Zaria*) *bonei* Baily.
Dicroloma (*Perissoptera*) *bailyi* (R. Etheridge, jr.).

(*c*) Railway cutting, south of Umfolosi.
Trigonoarca capensis (Griesbach).
Inoceramus expansus Baily.
Neithea quinquecostata (Sowerby).
Pleuromya africana (R. Etheridge, jr.).
Gyrodes tenellus Stoliczka.
Turritella (*Zaria*) *bonei* Baily.
Dicroloma (*Perissoptera*) *bailyi* (R. Etheridge, jr.).
Rostellites capensis Woods.
Ringicula woodsi sp. nov.

(*d*) Umfolosi valley, east of railway.
Inoceramus expansus Baily.
Pleuromya africana (R. Etheridge, jr.).

(*e*) Manuan Creek valley, south side.
Nordenskjöldia natalensis (Baily).
Neithea quinquecostata (Sowerby).
Pleuromya africana (R. Etheridge, jr.).
Veniella forbesiana (Stoliczka).
Protocardia hillana (Sowerby).

The above lists indicate a close similarity between the Lamellibranch and Gastropod assemblages of the various Zululand Upper Senonian localities, and it would seem legitimate to conclude that the absence of certain common Pondoland forms is not entirely due to the vagaries of collecting, but is due to a difference of facies between the two sets of deposits—an explanation which has already been advanced by Spath (*ibid.*, p. 270). According to du Toit (**16**, p. 327), *Trigonia shepstonei* and *Trigonocallista umzambiensis*, neither of which occur in Zululand, are found with other typical Pondoland forms at Incomanini on the Komati River in the southern part of Portuguese East Africa; the Transvaal Museum possesses specimens of *Nordenskjöldia natalensis*, *Glycimeris africana*, *Trigonocallista umzambiensis* and *Macrocallista euglypha* from the same locality. The Upper Senonian is represented in the northern part of Zululand, for the South African Museum possesses the following specimens :—

(*f*) West of the Pongola River, Ingwavuma district.
Nordenskjöldia natalensis (Baily).
Pleuromya africana (R. Etheridge, jr.).

The Albian. The Albian fauna of the Manuan Creek area has been dealt with principally by R. B. Newton and by Spath, in the papers quoted above. Spath (**60**) has recently described Upper Albian Ammonoidea from Catuane, Portuguese East Africa. An important link between the two areas is indicated by the occurrence in northern Zululand of the following Manuan Creek species :—

(*g*) Pongola River (Ingwavuma road drift).
Trigonia cricki R. B. Newton.
Neithea quadricostata (Sowerby).
Veniella etheridgei R. B. Newton.

DESCRIPTION OF THE SPECIES.

LAMELLIBRANCHIA.

FAMILY NUCULIDAE.

Genus NUCULA, Lamarck.

Nucula zululandensis, sp. nov.

(Pl. XXIX, figs. 6, 7.)

Material.—One specimen with the valves closed, the shell surface partly removed.

Description.—Shell triangular, rather elongated, moderately convex. Antero-dorsal margin long, gently convex; postero-dorsal margin short, straight. Ventral margin convex, long, meeting the antero- and postero-dorsal margins at sharp angles. Umbones small, curved inwards, and placed near the posterior end. Lunule posterior, narrow and elongated, ill-defined. Ornamentation where seen of extremely fine concentric striations.

Length, 15·5 mm.; height, 9 mm.; thickness of two valves, 6 mm.

Remarks.—The species is unlike any of those described by Stoliczka from Southern India, and is readily distinguished from the Pondoland form *N. kaffraria* described above by its elongate shape, absence of ornament, and obscure lunule. *N. planata* Deshayes (**76**, vol. i, pl. ii, figs. 11–15) is similar, but the anterior part is shorter and more rounded.

Locality.—Railway cutting, Umfolosi, S.A. Mus., No. 4869, collected by W. J. Wybergh.

Horizon.—Upper Senonian.

FAMILY ARCIDAE.

Genus TRIGONOARCA, Conrad.

Trigonoarca capensis (Griesbach).

1871. *Arca capensis*, Griesbach: Q.J.G.S., vol. xxvii, p. 66, pl. iii, figs. 10, 10*a*, *b*.

1904. *Trigonoarca umzambaniensis*, R. Etheridge, jr.: Sec. Rep. Geol. Surv. Natal and Zululand, p. 76, pl. i, figs. 1–5.

1906. *Trigonoarca capensis*, Woods: Ann. S. Afr. Mus., vol. iv, p. 288, pl. xxxiv, figs. 1, 2.

Remarks.—Etheridge assigned some specimens of *Trigonoarca* from Umkwelane Hill to Baily's *T. umzambaniensis* (**2**, p. 460, pl. xiii, fig. 1), and attempted to demonstrate points of difference between that species and *T. capensis* (Griesbach). It is highly probable that Baily's specimen belonged to *T. capensis*, which is one of the commonest species in the Umzamba beds; as the figure given by Baily is poor and the type is missing, the writer follows Woods in disregarding the earlier name. It follows that the Zululand forms must either be assigned to *T. capensis* or receive a new name. The writer has examined some half-dozen examples from Umkwelane Hill and numerous specimens from Pondoland, and concludes that the former belong to the same species. The exterior surfaces of the Umkwelane Hill specimens are on the whole better preserved than the examples from Pondoland, but the ornamentation is of the same nature. The steepness of the posterior slope varies considerably among the forms from both areas; the Zululand specimens usually have a steep posterior slope, while those from Pondoland are inclined to be more rounded; this character is not, however, a constant feature, for the Pondoland forms sometimes have the slope as steep as in the examples from Zululand; the objection raised by Etheridge, therefore, disappears.

Localities.—Umkwelane Hill, S.A. Mus., Nos. 5099, 5404, 5452, 5471, 5483, collected by A. L. du Toit and J. S. Hedges; Railway cutting, Umfolosi, No. 4830, collected by W. J. Wybergh.

Horizon.—Upper Senonian.

FAMILY PECTINIDAE.

Genus NEITHEA, Drouet.

Neithea quadricostata (J. Sowerby).

(Pl. XXX, figs. 10–12.)

1814. *Pecten quadricostata*, J. Sowerby: Min. Conch., vol. i, p. 121, pl. lvi, figs. 1, 2.
1903. *Pecten* (*Neithea*) *quadricostatus*, Woods: Cret. Lam. England, vol. i, p. 210, pl. xl, figs. 6, 7.
1909. *Neithea quadricostata*, R. Bullen Newton: Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 55, pl. ii, figs. 18–21.

Remarks.—This widespread species has been figured by R. B. Newton from the Manuan Creek area. The present collection includes several exceptionally well-preserved specimens, and as the figures given by Newton are rather poor, one of these is figured here.

Localities.—Manuan Creek, S.A. Mus., No. 2590; Pongola River, S.A. Mus., No. 3971; Ingwavuma Road Drift, Pongola River, S.A. Mus., No. 5529.

Horizon.—Albian.

FAMILY CARDIIDAE.

Genus CARDIUM, Linnaeus.

Sub-genus ACANTHOCARDIUM, Gray.

Cardium (Acanthocardium) denticulatum, Baily.

1855. *Cardium denticulatim*, Baily: Q.J.G.S., vol. xi, p. 460, pl. xiii, fig. 4.
1904. *Cardium bullen-newtoni*, R. Etheridge, jr.: Sec. Rep. Geol. Surv. Natal and Zululand, p. 78, pl. ii, figs. 14–16.
1906. *Cardium denticulatum*, Woods: Ann. S. Afr. Mus., vol. iv, p. 306, pl. xxxvi, fig. 11; pl. xxxvii, figs. 1, 2.

Remarks.—*C. bullen-newtoni* was created by Etheridge for some specimens from Umkwelane Hill, which were said to differ from the Pondoland species in that the umbonal region is more tumid, with the result that the anterior and posterior slopes are more pronounced. The writer has seen numerous specimens from Umkwelane Hill and Lake Itesa, as well as from Pondoland, and considers them all to belong to Baily's species. The tumidity of the umbonal region is subject to a certain amount of variation in both the Zululand and Pondoland forms, and the numerous examples seen by the writer all agree in having sharp, denticulated costae and toothed margins.

Localities.—Umkwelane Hill, S.A. Mus., Nos. 5106, 5113; Umkwelane Hill, S.A. Mus., No. 5500, collected by A. L. du Toit; Lake Itesa, Umfolosi, S.A. Mus., No. 4893, collected by W. J. Wybergh.

Horizon.—Upper Senonian.

FAMILY CYPRINIDAE.

Genus VENIELLA, Stoliczka.

Veniella etheridgei, R. Bullen Newton.

(Pl. XXXI, figs. 1–3.)

1909. *Veniella etheridgei*, R. B. Newton: Trans. Roy. Soc. S. Afr., p. 69, pl. vii, figs. 5, 6.

Material.—The collection includes several fine specimens, including two specimens showing the hinge of the left valve. The holotype described by Newton is an imperfect specimen, showing part of the left hinge only.

Description.—Shell large, remarkably thick, strongly inflated, trigonal. Umbones prominent, strongly curved inwards and anteriorly, well inflated; posterior carina extending from the umbones to the produced postero-ventral angle, strong, not developed into a raised ridge by lateral compression. Posterior region very steep, almost vertical. Antero-dorsal margin concave; ventral margin long, broadly rounded, meeting the antero-dorsal margin in an angle; postero-dorsal margin long, very slightly convex; the ventral margin at an angle of about 70° with the postero-dorsal margin. Lunule large, wide, deep, bounded by a high, rounded ridge but not defined by an impressed line. Escutcheon defined towards the umbo by a ridge, the surface sloping rapidly away from the ridge, which dies away posteriorly.

Left valve with a long, high, stout, posterior cardinal, situated against the flattened nymph; median cardinal stout, high, with a feeble sulcation; anterior cardinal consisting of a stout tubercle and an anteriorly extending ridge; the anterior and median cardinals separated by a relatively narrow socket; postero-lateral tooth ill-defined, consisting of a raised and thickened portion of the postero-dorsal margin, which fits into a deep groove on the opposite valve.

Ornamentation of numerous concentric striae and growth ridges and occasional elevated laminae; the posterior area with numerous oblique ridges which bend sharply at the carina; lunule with numerous closely set ridges.

Anterior adductor impression deep, enclosed in the produced anterior part of the shell.

Remarks.—The large and massive species is readily separated from other members of the genus, though it resembles large specimens of *V. forbesiana,* from which it differs in having a more massive hinge area, a less elevated and more obtuse carina, and a less well-developed left posterior lateral tooth.

Localities.—Manuan Creek, S.A. Mus., Nos. 2723*a–f*, collected by the resident magistrate of Ubombo; Middle branch of the Manuan Creek, S.A. Mus., Nos. 4928, 4975, 4986, collected by W. J. Wybergh; Pongola River, S.A. Mus., No. 3972; Ingwavuma Road Drift, Pongola River, S.A. Mus., No. 5534.

Horizon.—Albian.

Veniella forbesiana (Stoliczka).

(Pl. XXIX, figs. 1–5.)

1871. *Cyprina forbesiana*, Stoliczka: Cret. Pel. S. India, p. 197, pl. ix, figs. 2–8.
1905. *Roudaireia forbesiana*, Choffat: Nouvelles données, Angola, p. 42, pl. i, fig. 3.
1909. *Veniella forbesiana*, R. B. Newton: Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 67, pl. vii, figs. 1–4.
1912. *Roudaireia forbesiana*, Pervinquière: Pal. Tunis., Gastr. et Lam. Cret., p. 232, pl. xv, figs. 14, 15.

Material.—Numerous specimens, several small examples showing the hinge.

Description.—Shell elongately-ovate, trapezoidal, moderately to well inflated. Umbones prominent, strongly curved inwards and forwards. Posterior carina strongly developed, sharp, running from the umbones to the produced postero-ventral extremity; posterior slope moderately steep. Posterior margin well rounded; postero-ventral margin rounded and slightly pointed; antero-dorsal margin short, concave; anterior produced and sharply rounded; ventral margin gently rounded, often sinuous in front of the postero-ventral angle. Escutcheon bounded by an obscure keel running from the umbones posteriorly, about midway between the carina and the postero-dorsal margin, dying away ventrally. Depressed area beneath the umbones, but no defined lunule. Adductor impressions well marked, the anterior excavated.

Hinge of right valve: nymph narrow, with deep grooves above and below; posterior cardinal long, oblique, laterally compressed, stout, with a feeble groove along its summit; median cardinal reduced, plate-like, situated obliquely above the anterior and separated from it by a deep groove; anterior cardinal stouter; in front of the anterior cardinal a small tubercle is developed which fits into a small pit inferior to the left anterior cardinal; posterior lateral elongated, with a deep, long pit to receive the left lateral, with fine transverse striations.

Hinge of the left valve: posterior cardinal long, high, curved, oblique, close to the nymph, which is flattened and separated from it by a deep groove; median cardinal trigonal, stout, elevated, with a feeble median sulcation; anterior cardinal stout, trigonal, elongated anteriorly, the top connected with the base of the median cardinal by a thin lamina; posterior lateral stout, high, transversely striated.

Sculpture on the anterior of equidistant concentric elevated laminae separated by broad, finely striated, shallow sulcations, sometimes more irregular; posterior to the carina there are striations only.

Remarks.—The species is widespread, as it is known not only from the Trichinopoli Group but also from the Mediterranean region and from Angola. A small example is figured in this paper among the Pondoland forms. It is easily distinguished from *R. drui* by its less markedly triangular shape, more round outline, and less steep posterior slope. The curious lamina connecting the left median and anterior cardinals has not been seen in the other species.

Localities.—Recorded from the Manuan Creek area by R. B. Newton; Umkwelane Hill, S.A. Mus., Nos. 5103, 5105, collected by J. S. Hedges; Umkwelane Hill, S.A. Mus., No. 5471, collected by A. L. du Toit; Lake Itesa, Umfolosi, S.A. Mus., Nos. 4887, 4896, 4899, collected by W. J. Wybergh.

Horizon.—Upper Senonian.

Family ASTARTIDAE.

Genus Eriphyla, Gabb.

Eriphyla lenticularis (Goldfuss).

(Pl. XXIX, figs. 8–10.)

1840. *Lucina lenticularis,* Goldfuss: Petref. Germ., vol. ii, p. 228, pl. cxlvi, fig. 16.
1870. *Eriphyla lenticularis,* Stoliczka: Cret. Lam. S. India, p. 181, pl. vi, figs. 7–13.
1904. *Eriphyla lenticularis,* R. Etheridge, jr.: Sec. Rep. Geol. Surv. Natal and Zululand, p. 79, pl. i, figs. 20, 21.
1906. *Astarte* (*Eriphyla*) *lenticularis,* Woods: Ann. S. Afr. Mus., vol. iv, p. 301, pl. xxxv, fig. 20 (with full syn.).

Remarks.—The collection contains two small specimens from Lake Itesa, which closely resemble some larger forms from Pondoland. As they are very well preserved and show the hinge, figures of one of them are given here. Woods figured only the exterior of a right valve in his Pondoland paper, while the figures given by Etheridge of examples from Umkwelane Hill are rather poor.

Locality.—Lake Itesa, Umfolosi, S.A. Mus., No. 4884, collected by W. J. Wybergh.

Horizon.—Upper Senonian.

FAMILY VENERIDAE.

Genus MACROCALLISTA, Meek.

Sub-genus CALLISTINA, Jukes-Browne.

Macrocallista (*Callistina*) *andersoni* (R. Bullen Newton).

(Pl. XXX, figs. 13–18.)

1909. *Meretrix andersoni*, R. B. Newton : Trans. Roy. Soc. S. Afr., vol. i, pt. i, p. 75, pl. vi, figs. 7–9.

Material.—Numerous specimens, showing hinges of both valves.

Description.—Shell oval, moderately convex, considerably inequilateral. Antero-dorsal margin slightly concave, short; anterior margin rounded and passing gradually into the ovally curved extensive ventral margin; postero-dorsal margin long, slightly convex, oblique, produced; postero-ventral end narrow, subangulate. Umbones contiguous, small, moderately curved anteriorly. Lunule moderately depressed, cordiform, bounded by a groove. Escutcheon not defined. Pallial sinus deep, slightly ascending, rounded at the end.

Hinge in the right valve with three cardinals; the anterior and median laterally compressed, plate-like, diverging from beneath the umbo; posterior cardinal oblique, long, divided, the posterior part longer than the anterior part. In front of the cardinals in the right valve there is a moderately deep, elongate pit with very slightly raised upper and lower margins, the lower margin being rather more raised than the upper. Left valve with stout anterior and median cardinals diverging from beneath the umbo, the anterior nearly vertical; posterior cardinal long, slender, oblique; anterior lateral elongate, ridge-like.

Ornamentation of numerous close, equidistant, concentric ridges separated by deep grooves; continued on to the lunule.

Remarks.—R. B. Newton, who did not see the hinge of this species, described it as a *Meretrix*, and stated that it appears to be intermediary between J. de C. Sowerby's *Venus faba* and *V. ovalis*, both from the Upper Greensand of Blackdown. The former of these, however, is now referred to *Cyprimeria*, and the latter to *Clementia* (**76**, vol. ii, pp. 187 and 191) on account of the disposition of the teeth ; while the teeth of *M. andersoni* indicate clearly that it belongs to the same group as Sowerby's *Venus planus* (*ibid.*, vol. ii, p. 192, pl. xxx, figs. 1–6), made the genotype of *Callistina* by Jukes-Browne (**29**, p. 156).

There is a resemblance to Stoliczka's *Cytherea* (*Callista*) *fabulina* (**62**, p. 174, pl. xvi, figs. 31–33) from the Trichinopoli and Utatur Groups, especially in its strong and regular ornamentation, but the Indian shell is shorter and more oval in outline than the present species.

Newton notes a strong resemblance to *Venus pacifica* Möricke (**39**, p. 103, pl. vii, fig. 7), which has been made a synonym of *Venus auca* d'Orbigny and placed under *Cytherea* by Wilckens (**71**, p. 243, pl. xix, figs. 12–14). The right posterior cardinal in the excellent figures given by Wilckens appears to be entire and there is no mention of its being bifid in the text, hence that species cannot be included under *Callistina*. The Quiriquina species is larger than *M. andersoni* and possesses a much deeper and more rounded pallial sinus.

Pervinquière (**47**, p. 268, pl. xx, fig. 17) has recently assigned to this species three specimens from the Senonian of Tunis, but his identification rests only on external characters and must be regarded as doubtful. The Tunisian form seems to be a little less extended posteriorly and anteriorly and has a rather less prominent umbo.

M. (*Callistina*) *euglypha* (Woods), described earlier in this paper among the Pondoland forms, is very closely allied, but is shorter, more compressed, and with a much smaller lunule.

Localities.—Tributaries of the Manuan Creek (R. B. Newton) ; south side of the Manuan Creek Valley, S.A. Mus., Nos. 4926, 4936, 4938, collected by W. J. Wybergh.

Horizon.—Du Toit (**16**, p. 318) places the species among the Albian forms, but it may well be of later age.

Macrocallista (*Callistina*) *zululandensis*, sp. nov.

(Pl. XXIX, figs. 11–16.)

Material.—Three left valves, two of which show the hinge. The holotype is fairly well preserved but the posterior is missing ; S.A. Mus., No. 4889.

Description.—Shell oval, inequilateral, slightly convex. Antero-dorsal margin concave; anterior margin rounded, passing gradually into the uniformly convex ventral margin. Umbones moderately small, pointed, with considerable anterior curvature. Lunule elongate-ovate, slightly concave but raised towards the centre, limited by a distinct groove. Escutcheon not defined.

Hinge of the left valve consisting of three cardinal teeth; the anterior and median cardinals diverging from beneath the umbo, the anterior narrow and nearly vertical, the median thicker, very slightly curved and oblique, both tapering dorsally; posterior cardinal elongate, very thin, tending to be obsolete, situated on the flank of the moderately stout nymph. Antero-lateral strong, very long, parallel to the lunular margin, thicker and higher at its posterior end.

Surface ornamented with numerous concentric ridges separated by furrows of rather less width than the ridges, not continued on to the lunule.

Remarks.—This species differs from *M. plana* (Sowerby) (**76**, vol. ii, p. 192, pl. xxx, figs. 1–6), the type of *Callistina,* in the length of the anterior lateral tooth and coarse ornamentation, features which give it a strong resemblance to *Callistina wilckensi* Woods (**78**, p. 31, pl. xv, fig. 8; pl. xvi, figs. 10, 11; pl. xvii, figs. 1–3) and *C. thomsoni* Woods (*ibid.*, p. 32, pl. xvii, figs. 4–7; **36**, p. 595, figs. 55, 56), which have been elevated to a new sub-genus *Tikia* by Marwick (**36**, p. 595), with the latter as type. *M. zululandensis* has an even longer antero-lateral tooth than *C. wilckensi*; it is less inflated, the umbo is more pointed, and the lunule appears to be more elongate. *M. sculpturata* (Stoliczka) (**62**, p. 173, pl. vii, 7–9) appears to be relatively longer and with more widely separated ribs than either of these.

The lunule of Etheridge's *Cytherea* (?) *kaffraria* (**17**, p. 81, pl. ii, figs. 20–22), also from Umkwelane Hill, is stated to be inconspicuous and hardly defined from the anterior ends.

Localities.—Lake Itesa, Umfolosi, S.A. Mus., No. 4889, collected by W. J. Wybergh; Umkwelane Hill, S.A. Mus., Nos. 5107, 5495, collected by J. S. Hedges and A. L. du Toit.

Horizon.—Upper Senonian.

Genus Cyprimeria, Conrad.

Cyprimeria ? sp.

(Pl. XXIX, figs. 17–19.)

Remarks.—S.A. Mus., No. 4885, collected by W. J. Wybergh at Lake Itesa, Umfolosi, appears to be closely allied to *Cyprimeria ? natalensis* sp. nov. described above from Pondoland, but the absence of a view of the hinge prevents a definite generic determination. It differs from the Pondoland species in being relatively higher, the umbones being more pointed and with greater anterior curvature. In addition, the surface is covered with distinct concentric striations. The lunule is slightly larger in the Zululand form, being moderately large, elongately cordate, raised in the middle, limited by an impressed line.

Horizon.—Upper Senonian.

GASTROPODA.

Family TURBINELLIDAE.

Genus Semifusus, Swainson.

Sub-genus mayeria, Bellardi.

Semifusus (*Mayeria*) *natalensis*, sp. nov.

(Pl. XXX, figs. 1, 2.)

Material.—Holotype, S.A. Mus., No. 5407, surface very well preserved, complete except for the aperture.

Description.—Shell fusiform, moderately elongated. Spire composed of about 6 sharply carinated whorls. Spire longer than the last whorl. Carina situated near the centre of the whorls, but a little to the front, dividing the whorls into an upper and a lower flattened area. Sutures well marked. Last whorl large, rounded, anteriorly produced into a long canal.

Surface ornamented with numerous fine spiral ribs and with transverse lines. Carina of the whorls of the spire with tubercles at regular intervals.

Remarks.—This species is closely allied to the two Pondoland species described above, *S. umzambiensis* and *S. kaffraria*, but differs from them in having the carina placed near the centre of the whorls and in the ornamentation of numerous fine spiral ribs which occur on all parts of the whorls. In the two Pondoland species the spiral ribs are fewer in number, stronger, and absent or considerably reduced on the posterior side of each whorl.

Locality.—Umkwelane Hill, collected by A. L. du Toit.

Horizon.—Upper Senonian.

BRACHIOPODA.

Family RHYNCHONELLIDAE.

Genus Cyclothyris, M'Coy.

Cyclothyris spp.

(Pl. XXX, figs. 3–9.)

Remarks.—One of the noteworthy features of the fauna of the Upper Cretaceous deposits of Southern Africa is the great scarcity of the Brachiopoda; the only mention that has so far been made of the occurrence of the phylum is the remark by van Hoepen that he had obtained a Terebratulid from the Manuan Creek area (**66**, p. 220). This is somewhat surprising, in view of the fact that Stoliczka described as many as 21 species, belonging to 4 families, from the equivalent horizons of Southern India. It is of great interest, therefore, to be able to record three Rhynchonellids in the Zululand deposits, belonging apparently to three species, though it is to be regretted that their state of preservation does not permit of close comparison with other forms.

Species (*a*).—S.A. Mus., No. 4878, collected by W. J. Wybergh from Upper Senonian beds in a railway cutting near the Umfolosi, is a moderately inflated sub-triangular shell; the lower valve is slightly more inflated than the upper and has a small, sharply pointed, slightly curved apex, small foramen and small deltidial plates; the median sinus is very slight and each valve is ornamented with about 22 subequal ribs. The apical angle is 107°. Figures 5, 6.

Species (*b*).—S.A. Mus., No. 4879, collected by W. J. Wybergh at the same spot as the above, is very similar, but the median sinus is more evident and the apical angle is only about 85°. The valves are ornamented with about 22 ribs, 8 of which are situated opposite the sinus. Figures 7–9.

Species (*c*).—S.A. Mus., No. 4942, collected by W. J. Wybergh on the south side of the Manuan Creek Valley, presumably from Senonian deposits, is similar to the last, but has only 16 ribs. The apical region is missing. Figures 3, 4.

TABLE A.

Showing the distribution of the species within the Umzamba Beds, based on the collection made by Dr. T. W. Gevers.

	First Section.													Second Section.						
	1.	3.	4.	10.	12.	15.	16.	17.	18.	21.	22.	23.	T.	4A.	5A.	11A.	16A.	17A.	18A.	21A.
LAMELLIBRANCHIA.																				
Barbatia meridiana Woods		×																		
Trigonoarca capensis (Griesbach)		×					×					×	×	×	×				×	
Nordenskjöldia natalensis (Baily)		×	×	×				×		×			×	×	×	×			×	×
Glycimeris africana (Griesbach)		×	×	×	×	×	×	×		×			×	×	×				×	×
,, cf. *subplanata* (Stoliczka)																			×	×
Pinna cf. *decussata* Goldfuss									×										×	
Inoceramus expansus Baily								×	×				×	×					×	×
Ostrea sp. Rennie														×						
Alectryonia cf. *arcotensis* (Stoliczka)																			×	
Exogyra decussata Goldfuss		×												×						
Trigonia shepstonei Griesbach		×	×	×	×		×							×	×	×			×	
,, *elegans* Baily		×	×	×	×								×	×	×				×	×
Pecten (*Chlamys*) *amapondensis* Griesbach		×											×	×					×	
,, ,, *capensis* Woods		×											×	×					×	
Neithea quinquecostata (Sowerby)				×			×							×					×	×
Modiola typica (Forbes)												×		×	×					
Pholadomya umzambiensis Rennie													×							
Liopistha (*Psilomya*) *corrugata* Woods		×					×		×					×	×					
Veniella drui (Munier-Chalmas)													×	×						
Astarte? *amapondensis* Rennie															×					
Eriphyla lenticularis (Goldfuss)				×						×										×
Crassatellites africanus Woods		×													×				×	
,, *haughtoni* Rennie																			×	
Cardium (*Acanth.*) *denticulatum* Baily		×	×	×										×	×				×	

TABLE A.—*continued.*

	First Section.													Second Section.						
	1.	3.	4.	10.	12.	15.	16.	17.	18.	21.	22.	23.	T.	4A.	5A.	11A.	16A.	17A.	18A.	21A.
LAMMELLIBRANCHIA—*continued.*																				
Cardium (*Acanth.*) *griesbachi* Woods				×				×	×				×			×			×	×
Dosiniopsis geversi Rennie				×		×									×	×				×
Trigonocallista umzambiensis (Woods)		×		×	×								×		×				×	
,, *spathi* Rennie							×		×											
Macrocallista (*Callistina*) *euglypha* (Woods)		×		×			×		×					×		×			×	×
Solecurtus (*Azor*) *woodsi* Rennie		×																		
Cymbophora rogersi Rennie				×									×							
GASTROPODA.																				
Patella kaffraria Rennie		×											×							
Semisolarium bailyi (Gabb)		×		×			×	×		×			×	×	×				×	×
Chilodonta (*Agathodonta*) *africana* Rennie															×					
Margarites (*Solariella*) *radiatula* (Forbes)		×		×			×	×	×	×			×	×	×					×
Nerita umzambiensis Woods		×		×									×							
Pseudomelania sutherlandi (Baily)		×	×										×	×	×				×	×
Lysis capensis Rennie														×						
Natica (*Lunatia*) *multistriata* Baily		×											×	×					×	
Gyrodes tenellus Stoliczka		×		×			×	×	×	×			×	×	×	×			×	×
Turritella (*Zaria*) *bonei* Baily		×	×				×			×		×	×	×	×				×	×
,, (*Haustator*) *meadi* Baily		×		×			×	×					×		×				×	×
Arcotia vanhoepeni Rennie																			×	
Chenopus (=*Aporrhais*) sp.														×	×					
Dicroloma (*Perissoptera*) *bailyi* (R. Etheridge, jr.)			×					×						×	×				×	

Dicroloma (*Perissoptera*) sp., S.A.M. 8699									×											
,, ,, sp., S.A.M. 8494																				×
Siphonalia ? *umzambiensis* Rennie																			×	×
Lathyrus (*Mazzalina*) *geversi* Rennie													×							
Cryptorhytis pseudorigida Rennie		×					×													
,, ? sp. Rennie														×	×					
Paleopsephaea kaffraria Rennie													×		×					×
Pyropsis africana Woods			×																×	
,, *geversi* Rennie														×						
Rostellites capensis Woods							×	×				×	×	×					×	×
Turris ? *kaffraria* (Griesbach)																			×	
Cancellaria meridionalis Woods		×																		
Bullinella sp. Rennie														×						
Ringicula woodsi Rennie													×	×						
Eriptycha perampla Woods		×					×	×	×					×					×	×
CEPHALOPODA.																				
Gaudryceras varicostatum van Hoepen																	×			
Tetragonites superstes van Hoepen									×											
Schlüteria cf. *simplex* (van Hoepen)									×						×					
Hauericeras gardeni (Baily)							×		×			×		×	×	×	×			
Madrasites aff. *africanus* (van Hoepen)														×						
Hoploscaphites sp.													×	×						
Mortoniceras soutoni (Baily)	×																			
Pseudoschloenbachia umbulazi (Baily)		×						×	×			×		×			×		×	×
,, *pseudofournieri* Spath.									×											
,, *griesbachi* (Crick MS.) Spath.	×	×							×	×		×		×			×	×		
Spheniscoceras cf. *africanum* (Crick MS.) Spath.											×									
Diplomoceras ? *indicum* (Forbes)															×					
ECHINOIDEA.																				
Cassidulus umbonatus Woods													×	×					×	
Memiaster forbesi Baily														×					×	

Table B.

Showing the distribution of the Pondoland Upper Cretaceous Lamellibranchia and Gastropoda. Identical species are indicated by ×. The occurrence of an allied species is shown by the letter *a*.

Umzamba Beds, Pondoland.	Southern India.					Europe and N. Africa.			Southern Hemisphere.					
	Utatur Group.	Trichinopoli Group.	Ariyalur Group.	Valudayur Beds.	Trigonoarca Beds.	Upper Senonian.	Lower Senonian.	Pre-Senonian.	Zululand.	Central Moçambique.	Madagascar.	Angola.	South Patagonia.	Antarctica.
Lamellibranchia.														
Nucula kaffraria Rennie . . .						*a*								
Nuculana sp. Woods . . .														
Arca sp. Woods														
Barbatia meridiana Woods . .														
,, sp. Woods														
Trigonoarca capensis (Griesbach) .		*a*							×			*a*		
,, *elongata* Rennie . .														
Nordenskjöldia natalensis (Baily) .		*a*	*a*	*a*	*a*				×			×		*a*
Glycimeris africana (Griesbach) . .									×					
,, cf. *subplanata* (Stoliczka) .			×											
Pinna vanhoepeni Rennie . . .														
Pinna cf. *decussata* Goldfuss . .						×	×				*a*		*a*	*a*
Inoceramus expansus Baily . .			*a*						×		*a*			
Ostrea spp.														
Alectryonia cf. *arcotensis* (Stoliczka) .			×										*a*	
Exogyra decussata Goldfuss . .			*a*			×				×	*a*			
,, sp. Woods														
Trigonia shepstonei Griesbach . .														
,, *elegans* Baily . . .														
Pecten (*Chamys*) *amapondensis* Griesbach . . .														
,, ,, *capensis* Woods .														
,, (*Aequipecten*) *kossmati* Woods .														
,, (*Camptonectes*) *kaffraria* Rennie		*a*	*a*							*a*				
Neithea quinquecostata (Sowerby) .	×	×	×			×	×	×	×	×	×	×		
Spondylus cf. *calcaratus* Forbes . .		×			×						×			
Lima (*Acesta*) *obliquistriata* Forbes .			×											
Mytilus sp. Woods														
Modiola kaffraria Woods . . .														
,, *typica* (Forbes) . . .		×						×						
Pleuromya africana (R. Etheridge, jr.).									×					?*a*
Pholadomya umzambiensis Rennie .														
,, cf. *elliptica* Münster .						×	×							
Goniomya umzambiensis Rennie .														
Cercomya arcuata (Forbes) . .				×						×	×			
Liopistha (*Psilomya*) *corrugata* Woods.														
Veniella drui (Munier-Chalmas) . .			?*a*			×						×		
,, *forbesiana* (Stoliczka) . .		×			*a*		×		×	*a*	×	×		

TABLE B.—*continued.*

Umzamba Beds, Pondoland.	Southern India.					Europe and N. Africa.			Southern Hemisphere.					
	Utatur Group.	Trichinopoli Group.	Ariyalur Group.	Valudayur Beds.	Trigonoarca Beds.	Upper Senonian.	Lower Senonian.	Pre-Senonian.	Zululand.	Central Moçambique.	Madagascar.	Angola.	South Patagonia.	Antarctica.
LAMELLIBRANCHIA—*continued.*														
Astarte griesbachi Woods . . .			?*a*								*a*			
,, ? *amapondensis* Rennie . .														
Eriphyla lenticularis (Goldfuss) . .			×			×	×	×	×					
Crassatellites africanus Woods . .														
,, *haughtoni* Rennie . .			*a*											
Anisodonta ?? *umzambiensis* Rennie .														
Cardium (*Acanth.*) *denticulatum* Baily.			*a*						×			×		
,, ,, *griesbachi* Woods .														
Protocardia hillana (Sowerby), var. .			*a*						×	*a*	*a*	*a*		
Dosiniopsis geversi Rennie . .								*a*						
Cyprimeria ? *natalensis* Rennie . .									*a*					
,, (*Cyclorisma* ?) cf. *analoga* (Forbes) . . .		×										?*a*		
Trigonocallista umzambiensis (Woods)														
,, *spathie* Rennie . .														
Macrocallista (*Callistina*) *euglypha* (Woods)														
Palaeomoera umzambiensis Rennie .			?*a*	*a*								*a*		
,, *haughtoni* Rennie . .														
,, sp. Rennie . . .														
Macoma papyracea Rennie . .														
Solecurtus (*Azor*) *woodsi* Rennie .														
Cymbophora rogersi Rennie . .														
Mactra ? *kaffraria* Rennie . . .														
Martesia ? *sp.* Rennie . . .														
Teredo sp. Woods														
GASTROPODA.														
Patella kaffraria Rennie . . .														
Semisolarium bailyi (Gabb) . .														
Chilodonta (*Agathodonta*) *africana* Rennie								*a*						
Margarites (*Solariella*) *radiatula* (Forbes)	?×	×	×	×										
Nerita umzambiensis Woods . .														
,, *kaffraria* Woods . . .														
Trajanella dutoiti Rennie . . .		*a*	*a*											
Pseudomelania sutherlandi (Baily) .											*a*			
Lysis capensis Rennie . . .														
Natica (*Lunatia*) *multistriata* Baily .														
Gyrodes tenellus Stoliczka . . .		×	×						×					

TABLE B—*continued.*

Umzamba Beds, Pondoland.	Southern India.					Europe and N. Africa.			Southern Hemisphere.					
	Utatur Group.	Trichinopoli Group.	Ariyalur Group.	Valudayur Beds.	Trigonoarca Beds.	Upper Senonian.	Lower Senonian.	Pre-Senonian.	Zululand.	Central Moçambique.	Madagascar.	Angola.	South Patagonia.	Antarctica.
GASTROPODA—*continued.*														
Turritella (*Zaria*) *bonei* Baily . .		×	×						×					
(*Haustator*) *meadi* Baily .									×					
Arcotia vanhoepeni Rennie . .		*a*												
Confusiscala ornata (Baily) . .		*a*												
Chenopus [*Aporrhais*] *sp.* Woods .														
Dicroloma (*Perissoptera*) *bailyi* (R. Etheridge, jr.)									×					
Dicroloma (*Perissoptera*) *spp.* Rennie .														
Pugnellus auriculatus Woods . .														
,, *contortus* (Forbes) . .		×									*a*			
,, *sp.* Woods . . .														
Cypraea chubbi Rennie . . .														
Pirula (*Protopirula*) *capensis* Rennie .														
Tritonidea (*Cantharulus*) *kaffraria* Rennie		*a*												
Siphonalia ? *umzambiensis* Rennie .		*a*												
Lathyrus (*Mazzalina*) *geversi* Rennie .			*a*											
Cryptorhytis rigida (Baily). . .		*a*												
,, *pseudorigida* Rennie .														
,, *sp.* Woods . . .														
,, ? *sp.* Rennie . . .														
Paleopsephaea scalaris Rennie . .														
,, *kaffraria* Rennie . .														
Pyropsis africana Woods . . .														
,, *geversi* Rennie . . .														
Pirifusus bailyi Woods . . .														
Semifusus (*Mayeria*) *acuticarinatus* Rennie			*a*											
Semifusus (*Mayeria*) *umzambiensis* Rennie														
Semifusus (*Mayeria*) *kaffrarius* Rennie.														
Volutilithes sp. Woods . . .														
Rostellites capensis Woods . .														
Cancellaria meridionalis Woods . .														
,, *sp.* Woods . . .														
Turris ? *kaffraria* (Griesbach) . .														
Actaeon sp. Woods														
Actaeonella (*Trochactaeon*) *woodsi* Rennie							*a*							
Bullinella sp. Rennie			*a*						*a*					
Ringicula woodsi Rennie		*a*												
Eriptycha perampla Woods . .														
Anchistoma umzambiense Rennie .														

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